

Catalogue of American Amphibians and Reptiles.

Ernst, C.H., and J.F. McBrean. 1991. *Terrapene carolina*.

***Terrapene carolina* (Linnaeus)**
Eastern Box Turtle

Testudo carolina Linnaeus, 1758:198. Type-locality, "Carolina", restricted to vicinity of Charleston, Charleston County, South Carolina by Schmidt, 1953:93. Holotype, undesignated.

Testudo carinata Linnaeus, 1758:198. Type-locality, "Calidis regionibus", restricted to Charleston, Charleston County, South Carolina by Schmidt, 1953:93. Holotype, undesignated.

Testudo brevi-caudata Lacépède, 1788:169. *Nomen substitution pro Testudo carolina* Linnaeus, 1758.

Testudo incarcerata Bonnatere, 1789:29. Type-locality, "L'America Septentrionale", restricted to Philadelphia, Philadelphia County, Pennsylvania by Schmidt, 1953:93. Holotype, undesignated.

Testudo incarcerato-striata Bonnatere, 1789:29. Type-locality, "L'America Septentrionale", restricted to the vicinity of Philadelphia, Philadelphia County, Pennsylvania by Schmidt, 1953:93. Holotype, undesignated.

Testudo clausa Gmelin: 1789:1042. Type-locality, "North America", restricted to the vicinity of Philadelphia, Philadelphia County, Pennsylvania by Schmidt, 1953:94. Holotype, undesignated.

Testudo virgulata Latreille, In Sonnini and Latreille, 1801:100. Type-locality, "Charleston [Charleston County], South Carolina". Holotype, undesignated.

Testudo caroliniana: Daudin, 1803:207. *Lapsus calami*.

Emys clausa: Schweigger, 1814:315.

Emys virgulata: Schweigger, 1814:316.

Emys schneideri Schweigger, 1814:317. Type-locality, unknown, restricted to the vicinity of Philadelphia, Philadelphia County, Pennsylvania by Schmidt, 1953:94. Holotype, undesignated.

Terrapene clausa: Merrem, 1820:28.

Monoclista kentuckensis Rafinesque, 1822:5. Type-locality, "Kentucky". Holotype, undesignated.

Cistudo clausa: Say, 1825:214.

Terrapene carolina: Bell, 1825:309. First use of combination.

Terrapene maculata Bell, 1825:309. Type-locality, unknown, designated as the vicinity of Philadelphia, Philadelphia County, Pennsylvania by Schmidt, 1953:94. Holotype, undesignated.

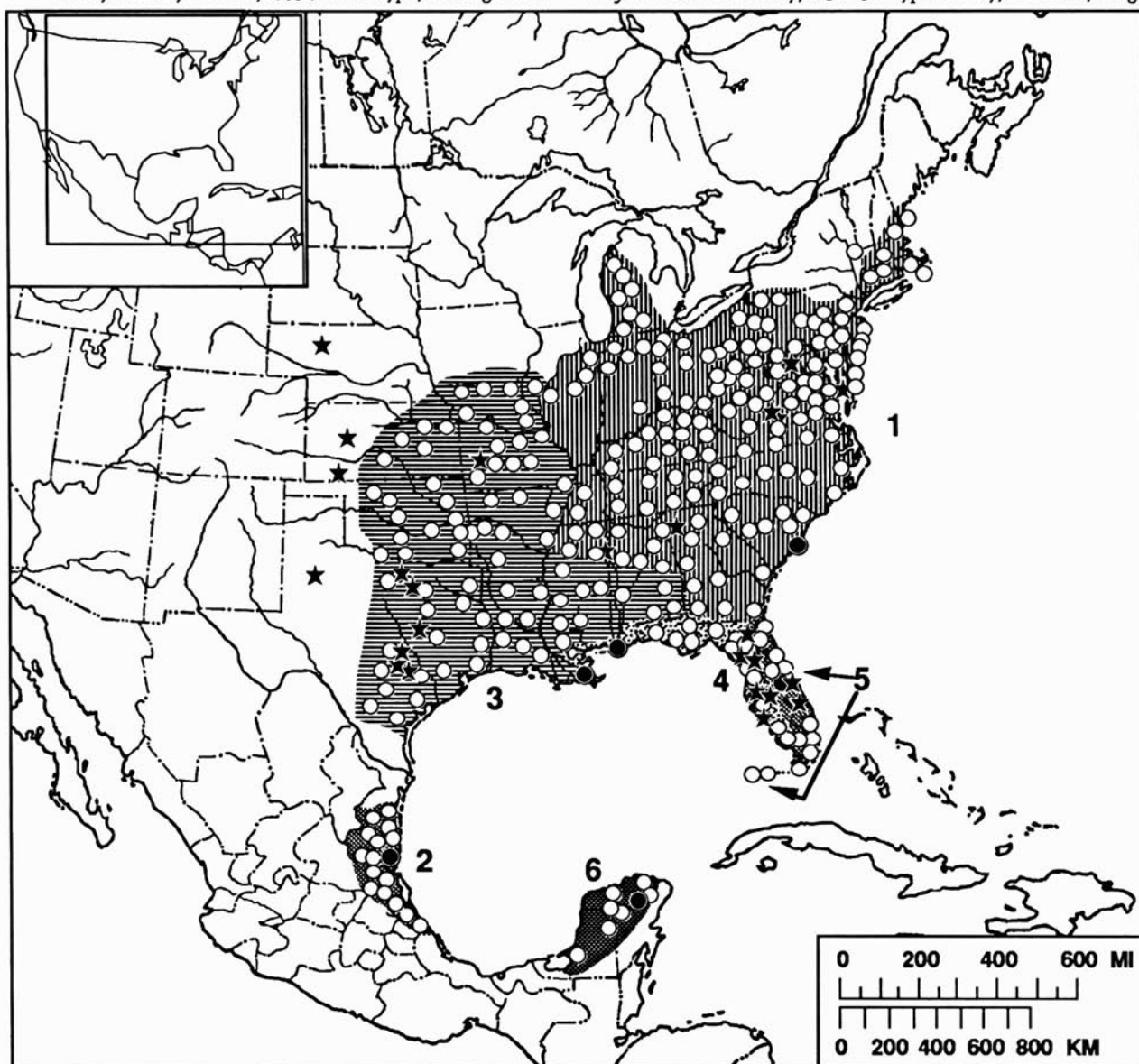
Terrapene nebulosa Bell, 1825:310. Type-locality, unknown, designated as the vicinity of Philadelphia, Philadelphia County, Pennsylvania by Schmidt, 1953:94. Holotype, undesignated.

Emys tridentaculata: A. Saint Hilaire, In Cuvier, 1829:11. *Nomen nudum*.

Emys (Cistudo) carolinae: Gray, 1831a:7. *Ex errore*.

Cistudo carolina: Gray, 1831b:18.

Emys kinosternoides Gray, 1831b:32. Type-locality, unknown, designated.



Map. Solid circles mark type-localities; hollow circles indicate other selected records. Stars indicate selected fossil localities.

nated as the vicinity of Philadelphia, Philadelphia County, Pennsylvania by Schmidt, 1953:94. Holotype, undesigned; Boulenger (1889:117) stated that it was in the collection of the Royal College of Surgeons, London.

Cistudo virginica Agassiz, 1857:445. Type-locality, "New England, and westward...Michigan...Carolinas", restricted to Springfield, Middlesex County, Massachusetts by Smith and Smith, 1980: 553. Syntypes, Museum of Comparative Zoology, 1526, 1531-1533 (males), 1527-1530 (females), Goldsboro, Wayne County, North Carolina, collected by W. C. Kerr, date unknown; 1534-1535 (males), Beaufort County, North Carolina, collected by R. Barnwell, Jr., date unknown; 1537 (male), Ann Arbor, Washtenaw County, Michigan, collected by Prof. A. Winchell, date unknown; 1538 (male), Hickman's Landing, Fulton County, Kentucky, collected by A. Hyatt, Jr., date unknown; 1539 (female), New Jersey, collected by A. Mayor, date unknown; 1540 (female), New York, collected by J. Froebel, date unknown; 1542 (female), Massachusetts, collector and date unknown; 1543-1544 (females), collected by Mr. Whitaker, date unknown; 1545, 1547-1549 (females), 1546, 1550 (males), Springfield, Middlesex County, Massachusetts, collected by J. A. Allen, date unknown; 1552 (young male), North Carolina, collected by W. C. Kerr, date unknown; 1554 (juvenile), Delaware River, collector and date unknown; 1555 (1) (juvenile female), 1555 (2) (juvenile male), Washington, D.C., collected by Prof. S. F. Baird, date unknown; 1556 (two juveniles, possibly females), locality, collector and date unknown; and 1557 (juvenile, possibly female), Tennessee, collector and date unknown (series not examined by authors). See Comments.

Terrapene caroliniana: Strauch, 1862:96.

Terrapene euryptigia Cope, 1869:124. Type-locality, "Pleistocene deposits in [Oxford Neck] Talbot County, Maryland". Holotype, American Museum of Natural History 1484, entoplastron and posterior carapace element (not examined by authors).

Terrapene putnami Hay, 1906:30. Type-locality, "Alafia River, Florida, about a mile from its mouth". Holotype, American Museum of Natural History 6097, left hypoplastral bone, collected by Professor F. W. Putnam (not examined by authors).

Terrapene formosa Hay, 1916a:57. Type-locality, "Ocala, [Marion County], Florida. Pleistocene". Holotype, United States National Museum 8825 (formerly Geological Survey of Florida 2973), posterior two-thirds of carapace, collector and date not given (examined by authors).

Terrapene carolina: Proctor, 1922:20. *Ex errore*.

Terrapene carolina: Breder, 1924:63. *Ex errore*.

Terrapene singletoni Gilmore, 1928:1. Type-locality, "Two miles west of Melbourne, Brevard County, Florida... Pleistocene." Holotype, U.S. National Museum 11181, partial carapace, presented by C. P. Singleton in either 1925 or 1926 (examined by authors).

Terrapene carolina putnami: Auffenberg, 1958:53. First use of recognized combination.

• **Content.** Six living subspecies (*Terrapene carolina carolina*, *T. c. mexicana*, *T. c. triunguis*, *T. c. major*, *T. c. bauri*, and *T. c. yucatana*), and the fossil subspecies *T. c. putnami* are recognized.

• **Definition.** *Terrapene carolina* has a keeled, domed, elongated carapace (to 21 cm) which is not serrated posteriorly and is highest posterior to the plastral hinge. The medial keel usually is present on vertebrals 2-4; vertebral 1 is elevated at a steep angle (50° or more), and the first marginals usually are rectangular. Vertebrals are wider than long. The carapace usually is brown but also often horn-colored or black, usually with an extremely variable pattern of yellow or orange radiating lines, spots, bars, or irregular blotches on each scute. The plastron bears a moveable hinge between the pectoral and abdominal scutes, and is often as long or longer than the carapace. An axillary scute may be present. Usually, the hindlobe does not have a posterior notch. The plastron is tan to brown; it may be patternless, show dark blotches or smudges, a dark central area with branches along the seams, or have a pattern of yellow radiating lines. The head is small to moderate in size with a nonprojecting snout and a medially hooked upper jaw lacking a notch. Its dorsal surface is covered with smooth skin. Coloration usually is brown with yellow, orange, or red lateral spots, but the head may be patternless or entirely reddish, white, brown or black. The forelimbs are covered with large brown, yellow, orange or red scales; other skin usually is brown. The toes are heavily clawed and partially webbed; hind toes total either three or four per foot. The foreleg colors of most males are

of brighter contrast than those of females. The posterior lobe of the plastron is normally concave in males, flat or slightly convex in females. Male hind claws are stocky, considerably curved and usually longer than those of females, which have shorter, more slender and straighter hind claws. Males have longer, thicker tails with the vent near or beyond the posterior carapacial rim; the female tail is short with the vent beneath the posterior marginals. The often used red eye coloration to distinguish the sexes is not sufficient, as only about 40-50% of the males of the subspecies occurring in the United States have red irises (Joseph P. Ward, in Litt.).

• **Descriptions.** General descriptions are in Boulenger (1889, 1895), Cahn (1937), Pope (1939), Carr (1952), Milstead (1969), Nietzke (1969), Cochran and Goin (1970), Ernst and Barbour (1972, 1989), Conant (1975), Zappalorti (1976), Behler and King (1979), Pritchard (1979), Smith and Smith (1980), Smith and Brodie (1982), Müller (1987), Capula (1989), Dundee and Rossman (1989), Tynning (1990), and Conant and Collins (1991). Other descriptions are as follows: egg (Agassiz, 1857; Carr, 1952; Ernst and Barbour, 1972), embryological development (Ewert, 1985); hatchlings (Carr, 1952; Ernst and Barbour, 1972); nests (Allard, 1948); karyotype (Stock, 1972; Killebrew, 1977); courtship (Carpenter and Ferguson, 1977; Ernst, 1981); skull (Baur, 1891; Ruckes, 1937; McDowell, 1964; Gaffney, 1979); cervical vertebrae (Williams, 1950); pelvis (Ruckes, 1929); and penis (Zug, 1966).

• **Illustrations.** Color illustrations of juveniles and/or adults are in Cochran and Goin (1970), Ernst and Barbour (1972), Conant (1975), Zappalorti (1976), Behler and King (1979), Pritchard (1979), Smith and Brodie (1982), Müller (1987), Capula (1989), Dundee and Rossman (1989), and Conant and Collins (1991); black and white photographs or drawings are in Sowerby and Lear (1872), Cahn (1937), Pope (1939), Carr (1952), Wermuth and Mertens (1961), Milstead (1969), Nietzke (1969), Ernst and Barbour (1972, 1989), Zappalorti (1976), Pritchard (1979), Smith and Smith (1980), Obst (1986), and Tynning (1990). Other illustrations are as follows: eggs and embryos (Agassiz, 1857; Ewert, 1979), skull (Boulenger, 1889; Auffenberg, 1958; Wermuth and Mertens, 1961; Ernst and Barbour, 1972; Gaffney, 1979), pelvis (Ruckes, 1929), vestigial ribs (Hoffstetter and Gasc, 1969), brain (Starck, 1979), ear and its functions (Wever, 1978), oxygen affinity and dissociation curves (Dessauer, 1970; Wood and Lenfant, 1976), sexual dimorphism (Cahn, 1937), courtship and mating behavior (Cahn, 1937; Carpenter and Ferguson, 1977; Obst, 1986 and Müller, 1987), nesting behavior (Allard, 1935), plaster casts of nests (Allard, 1948), corpora lutea (Altland, 1951), resting form (Stickel, 1950), and distribution (Iverson, 1986).

• **Distribution.** In the United States, *Terrapene carolina* ranges from southern Maine south to the Florida Keys and west to southern Michigan, Illinois, eastern Kansas, Oklahoma, and Texas. The species may also be found in isolated localities in New York and western Kansas. In México, it occurs in the states of Campeche, Quintana Roo, San Luis Potosí, Tamaulipas, Veracruz, and Yucatán. The peripheral boundaries of the species range have been somewhat clouded because this turtle is a popular pet and individuals are often transported and then released in places far from their natural distributional area.

• **Fossil Record.** Now assigned to *Terrapene carolina* are the extinct subspecies *T. c. putnami* Hay, 1906 and several fossils once considered species (Milstead, 1969): *Cistudo marnocki* Cope, 1878; *T. euryptigia* Cope, 1869; *T. canaliculata* Hay, 1907; *T. antipex* Hay, 1916a; *T. formosa* Hay, 1916a, *T. innocia* Hay, 1916a; *T. whitneyi* Hay, 1916b; *T. bulweri* Hay, 1921; *T. impressa* Hay, 1924; *T. singletoni* Gilmore, 1928; and *Trachemys nuchocarinata* Hay, 1916a.

Fossil remains of *T. carolina* are known from the Miocene (Clarendonian) of Kansas and Nebraska (Holman, 1975, 1981), Pliocene (Hemphillian and Blancan) of Florida (Milstead, 1969), and in the Pleistocene from the Blancan of Florida and Maryland (Milstead, 1969; Holman, 1977); Irvingtonian of Florida, Kansas, Maryland, Nebraska and Texas (Milstead, 1969), and the Rancholabrean of Florida, Georgia, Mississippi, Missouri, Texas, and Virginia (Auffenberg, 1957, 1959; Milstead, 1969; Holman, 1967, 1969a, 1969b, 1978; McClure and Milstead, 1967; Gillette, 1974; Jackson and Kaye, 1974; Moodie and Van Devender, 1977; Fay, 1984; Holman and Clausen, 1984; Holman and Winkler, 1987). Remains of *T. carolina* have also been found at archeological sites; summaries of such

records in Canada, the United States, and México are in Hatt and Langebartel (1953), Bleakney (1958), Wing (1965), Adler (1968, 1969, 1970), Latham (1969b), and Alvarez (1976).

• **Pertinent Literature.** General accounts are in Baur (1893), Taylor (1895), Brimley (1904), Babcock (1919), Dittmars (1934), Allard (1935, 1948, 1949), Cahn (1937), Pope (1939), Carr (1952), Dickson (1953), Oliver (1955), Duellman and Schwartz (1958), Kirsche (1969), Ernst and Barbour (1972, 1989), Conant (1975), Murphy (1976), Harless and Morlock (1979), Pritchard (1979), Smith and Smith (1980), Stuart and Miller (1987) and Dundee and Rossman (1989). Other papers are listed by topic as follows: evolution (Milstead, 1969; Gillette, 1974); systematics (Barbour and Stetson, 1931; Müller, 1936; Smith, 1939; Smith and Taylor, 1950b; Auffenberg, 1958; Martin, 1958; McDowell, 1964; McCoy and Richmond, 1966; Milstead, 1969; Smith and Smith, 1980; Kiester et al., 1982); karyotype (Huang and Clark, 1967; Clark et al., 1970; Stock, 1972; Stock and Mengden, 1975; Killebrew, 1977; Bickham and Baker, 1979; Bickham and Carr, 1983); distribution and zoogeography (Smith and Taylor, 1950a, 1950b; Neill, 1954, 1958; Auffenberg and Milstead, 1965; Savage, 1966; Blaney, 1971; Iverson, 1986; Paukstis and Janzen, 1988; Iverson and Etchberger, 1989; Polley, 1989; Gibbons and Semlitsch, 1991); morphology (Johnston, 1915; Ruckes, 1929; Knoll, 1935; Lynn, 1937; Haines, 1946, 1969; Green, 1950; Altland, 1951; Hebard and Charipper, 1955; Zangerl and Johnson, 1957; Smith, 1958; Smith and James, 1958; Parsons, 1960, 1968; Richmond, 1964; Williams and Han, 1964; Sehe, 1965; Zug, 1966, 1971; Hofstetter and Gasc, 1969; Milstead, 1969; Zangerl, 1969; Baird, 1970; Bockman, 1970; Carey, 1970; Duguy, 1970; Saint-Girons, 1970; Cook et al., 1972; Schumacher, 1973; Walker, 1973, 1979; Winokur and Legler, 1974; Fox, 1977; Parsons and Cameron, 1977; Wever, 1978; Elghammer et al., 1979; Gaffney, 1979; Starck, 1979; Barten, 1981; Leuck and Carpenter, 1981; Wilbern and Ingold, 1983; Holman, 1984; Winokur, 1988); embryology and development (Nelson, 1953; Crooks and Smith, 1958; Tucker and Funk, 1976; Ewert, 1979, 1985; Bellairs and Bryant, 1985; Raynaud, 1985; Cohen, 1986; Rose, 1986); histology (Balmer, 1951; Clark and Karzon, 1967a, 1967b; Huang and Clark, 1967; Parsons and Cameron, 1977); growth (Lynn, 1937; Babcock, 1939; Ewing, 1939; Nichols, 1939a; Patterson, 1978; Stickel and Bunck, 1989); longevity (Townsend, 1926; Deck, 1927; Babcock, 1928; Allard, 1949; Edney and Allen, 1951; Price, 1951; Lapeer, 1953; Oliver, 1953a, 1953b; Nigrelli, 1954; James, 1961; Latham and Schlauch, 1969; Graham and Hutchison, 1969; Bowler, 1977; Williams and Parker, 1987); albinism (Hensley, 1959; Arndt, 1980);

carapacial pitting (Carpenter, 1956); immunology and electrophoresis (Leone and Wilson, 1961; Frair, 1962, 1963; Hildeman, 1962; Dozy et al., 1964; Cooper et al., 1985; Mao et al., 1987); physiology (Anderson and Wilbur, 1948; Altland and Parker, 1955; Hutton and Goodknight, 1957; Parker and Altland, 1957; Payne, 1957; Altland and Thompson, 1958; Musacchia and Chladek, 1961; Smith and Nickon, 1961; Schwartz and Kaplan, 1962; Adler and Small, 1963; Dodge and Folk, 1963; Robinson and Schmidt-Nielsen, 1963; Hutton, 1964; Payne and Burke, 1964; Quay and Wilhoft, 1964; Hutchison and Szarski, 1965; Schmidt-Nielsen and Bentley, 1966; Helmy and Hack, 1967; Sullivan and Riggs, 1967; Ernst, 1968; Helmy et al., 1969; Morgan and Singh, 1969; Dessauer, 1970; Brisbin, 1972; Mogareidge and Hammel, 1975; Bennett and Dawson, 1976; Bentley, 1976; Elghammer and Johnson, 1976; McDonald, 1976; Wood and Lenfant, 1976; Skoczylas, 1978; Belekova, 1979; Erskine and Hutchison, 1981; Sturbaum, 1981; Sturbaum and Bergman, 1981; Bartholomew, 1982; Bennett, 1982; Gregory, 1982; Lillywhite and Maderson, 1982; Minnich, 1982; Sturbaum, 1982; Monagas and Gatten, 1983; Karasov et al., 1985; Risher and Claussen, 1987; Packard and Packard, 1988; Ultsch and Anderson, 1988; Vivien-Raels et al., 1988; Olson, 1989; Yin et al., 1989; Costanzo and Claussen, 1990; Claussen et al., 1991); parasites and disease (Kepner, 1912; Ewing, 1926; Peters, 1948; Mehrtens, 1951; King and Griffo, 1958; Jackson et al., 1969, 1972; Ernst and Barbour, 1972; Pence and Casto, 1975; Abercrombie, 1977; Ernst and Ernst, 1977, 1979; Lawler, 1977; Crispens and Marion, 1981; Rowley and Moskaluk, 1985; Weitzmann et al., 1985; McAllister, 1987; Baxter and Meek, 1988; Oliver et al., 1988); DDT and other contaminants (Stickel, 1951; Ferguson, 1963; Holcomb and Parker, 1979; Beresford et al., 1981); radiation effects (Altland et al., 1951; Cosgrove, 1965); entrapment by railroad tracks (Helms and Stains, 1966); ecology (Surface, 1908; Wetmore, 1920; Nichols, 1939c; Penn and Pottharst, 1940; Bogert and Cowles, 1947; Allard, 1948, 1949; Neill, 1948b, 1958; Barbour, 1950; Stickel, 1950, 1951; Myers, 1952; Wood and Goodwin, 1954; Guibe and Saint-Girons, 1955; Dearoff, 1956; Hutchison, 1956; Carpenter, 1957; Williams, 1962; Murphy, 1964; Brattstrom, 1965; Hutchison et al., 1966; Adler, 1968; Ernst, 1968; Dolbeer, 1969, 1971; McCoy, 1969; Russo, 1973; Reagan, 1974; Schwartz and Schwartz, 1974; Yahner, 1974; Dodge et al., 1978; Stickel, 1978; Auffenberg and Iverson, 1979; Hutchison, 1979; Carr and Houseal, 1981; Erskine and Hutchison, 1981; Rust and Roth, 1981; Avery, 1982; Clark, 1982; Gregory, 1982; Iverson, 1982; Strass et al., 1982; Wilbern and Ingold, 1983; Strang, 1983; Holman, 1984; Muir, 1984; Schwartz et al., 1984; Kiester, 1985; Vance, 1985; Braun and Brooks, 1987; Gatten, 1987; Williams and Parker, 1987; Greene, 1988;

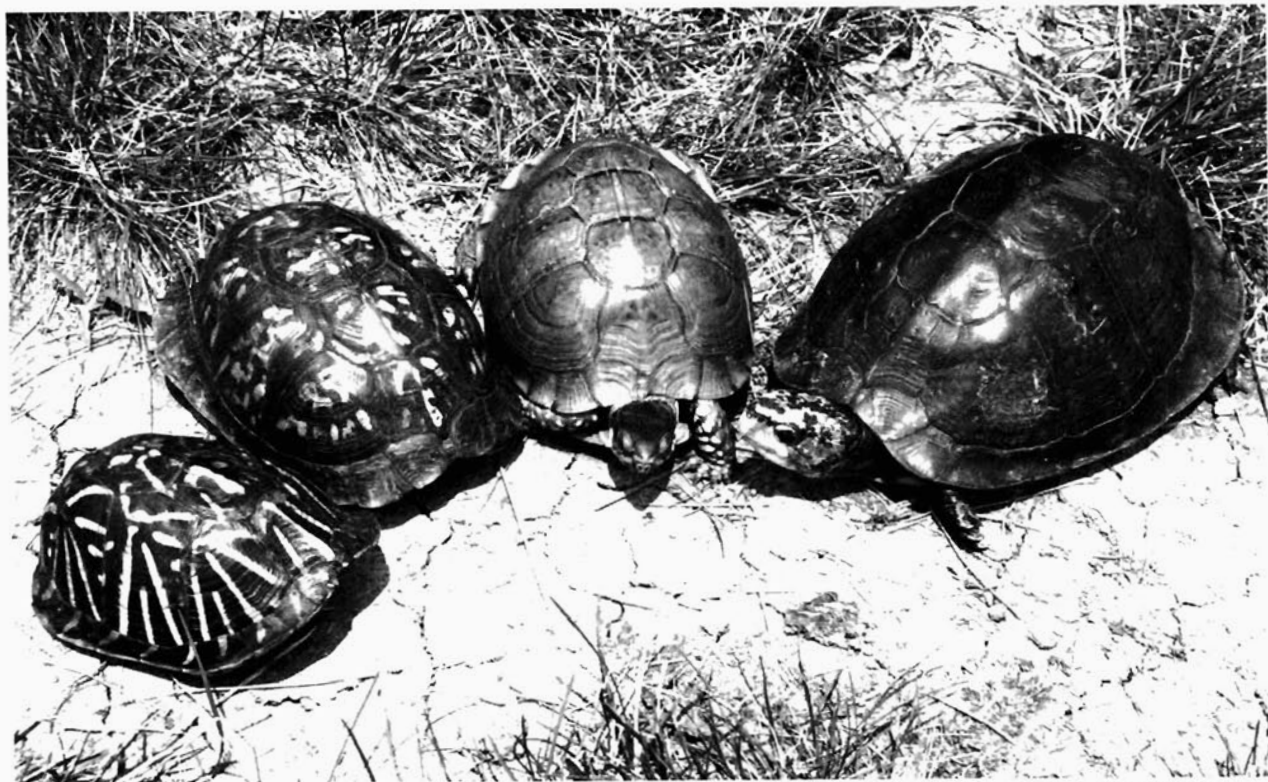


Figure 1. United States subspecies of *Terrapene carolina*; left to right: *bauri*, *carolina*, *triunguis*, and *major* (Roger W. Barbour).



Figure 2. *Terrapene carolina carolina* (Roger W. Barbour).

Adams et al., 1989; Congdon et al., 1989; Stickel, 1989; Grobman, 1990); food habits (Surface, 1908; Creaser, 1940; Moore, 1953; Myers, 1956; Bush, 1959; Klimstra and Newsome, 1960; Latham, 1968, 1969a; Boice, 1970; Alsop and Wallace, 1978; Rust and Roth, 1981; Braun and Brooks, 1987; Anton, 1990); behavior (Wickham, 1922; Breder, 1924, 1927; Frothingham, 1936; Nichols, 1939b, 1939c; Allard, 1948, 1949; Neill, 1948a; Stickel, 1950; Beltz, 1954; Wood and Goodwin, 1954; Myers, 1956; Wever and Vernon, 1956; Gould, 1957, 1959; Beltz, 1958; Verway, 1958; Hutchison and Vinegar, 1963; Evans, 1964; Hayes and Saiff, 1967; Rosenbaum, 1968; Lemkau, 1970; Dolbeer, 1971; Flanagan et al., 1974; Schwartz and Schwartz, 1974; Broscole, 1976; Burghardt, 1977; Carpenter and Ferguson, 1977; Shalet, 1977; Harding, 1978; Wever, 1978; Harless, 1979; Manton, 1979; Morlock, 1979; Posey, 1979; Tyler, 1979; Walker, 1979; DeRosa and Taylor, 1980, 1982; Carr and Houseal, 1981; Erskine and Hutchison, 1981; Kiester et al., 1982; Wilbern, 1982; Schwartz et al., 1984; Mathis and Moore, 1988; Adams et al., 1989; Hayes, 1989; Stickel, 1989); reproduction (Ewing, 1933; Allard, 1939; Nichols, 1940; Penn and Pottharst, 1940; Ewing, 1943; Finneran, 1948; Neill, 1948a; Altland,

1951; Evans, 1951a, 1951b, 1952, 1953; Legler, 1955; Smith and List, 1955; Fox, 1956; Lin, 1958; Evans, 1964, 1968; Schwartz, 1968; Mertens, 1973; Hattan and Gist, 1975; Tucker and Funk, 1976, 1977, 1978a, 1978b; Carpenter and Ferguson, 1977; Iverson, 1977; Congello, 1978; Ehrenfeld, 1979; Ewert, 1979; Moll, 1979; Berry and Shine, 1980; Reimer, 1981; Warner, 1982; Dimond, 1983; Magiola, 1984; Levell, 1985; Congdon and Gibbons, 1985; Ewert, 1985; Kasinsky et al., 1987; Packard and Packard, 1988); hybridization (Clark, 1935; Shannon and Smith, 1949; Mertens, 1950, 1956; Smith, 1955; Blaney, 1968; Ward, 1968); intergradation (Smith and Sanders, 1952).

• **Etymology.** The specific name *carolina* is for the Carolina region of North America. Subspecific names are derived as follows: *mexicana* is for México; *triunguis* is from the Latin words *tri*, three, and *unguiculus*, nail or claw, referring to the three toes on each hind foot; *major* is Latin for larger or greater, and refers to the relatively large size of this subspecies; *bauri* is a patronym for George Herman Carl Ludwig Baur, an early researcher of the genus; and *yucatanica* is for the Yucatán region of México.

• **Comments.** In addition to the syntypes listed for *Cistudo virginea*, a series of ten embryos and hatchlings (Museum of Comparative Zoology, 168; not examined by authors) was figured by Agassiz (1857), but whether or not these specimens should also be considered syntypes is questionable.

The holotype of the fossil species *Terrapene impressa* was not designated by Hay (1924), but, since the name was published in combination with an illustration, it does meet the ICZN pre-1931 rules, and, since the nominal species is based on this single specimen, it is the holotype by default. The type-specimen is part of a collection made by Dr. Francis in the early 1900's originally deposited in the museum of Texas A&M University. After that museum closed, the Francis collection was transferred to the Texas Memorial Museum, University of Texas, Austin, and the specimen is now in the Vertebrate Paleontology Laboratory, Balcones Research Center, of that institution (Melissa C. Winans, in Litt.).

Syntypes 1505-1508 of *Terrapene c. major* have been identified as *T. c. bauri* (Jose P. Rosado, in Litt.).



Figure 3. Variation in *Terrapene carolina carolina* (Roger W. Barbour).

Milstead (1967, 1969) considered *Terrapene carolina* to consist of several subspecies, and thought that *T. c. major* and *T. c. triunguis* intergraded along the Gulf Coast in southeastern Louisiana. However, Ward (1980) regarded *T. major* as a distinct species ranging from the Mississippi River to peninsular Florida. Ward did not use the same characters as Milstead in defining *T. major*, and several of his statements are contradictory (Dundee and Rossman, 1989:194). Dundee and Rossman (1989), after examining additional specimens from St. Charles Parrish, Louisiana, concluded that *T. c. major* is best regarded as a subspecies, as interpreted by Milstead (1969).

1. *Terrapene carolina carolina* (Linnaeus)

Testudo carolina Linnaeus, 1758:198. See species synonymy.
Testudo carinata Linnaeus, 1758:198. See species synonymy.
Testudo brevis-caudata Lacépède, 1788:169. See species synonymy.
Testudo incarcerationata Bonnaterre, 1789:29. See species synonymy.
Testudo incarcerationata-striata Bonnaterre, 1789:29. See species synonymy.
Testudo clausa Gmelin, 1789:1042. See species synonymy.
Testudo virgulata Latreille, In Sonnini and Latreille, 1801:100. See species synonymy.
Testudo caroliniana Daudin, 1803:207. See species synonymy.
Emys clausa: Schweigger, 1814:315. See species synonymy.
Emys virgulata: Schweigger, 1814:316. See species synonymy.
Emys schneideri Schweigger, 1814:317. See species synonymy.
Terrapene clausa: Merrem, 1820:28. See species synonymy.
Monoclista kentuckensis Rafinesque, 1822:5. See species synonymy.
Cistudo clausa: Say, 1825:214. See species synonymy.
Terrapene carolina: Bell, 1825:309. See species synonymy.
Terrapene maculata Bell, 1825:309. See species synonymy.
Terrapene nebulosa Bell, 1825:310. See species synonymy.
Emys tritenticulata: A. Saint Hilaire, In Cuvier, 1829:11. See species synonymy.
Emys (Cistudo) carolina: Gray, 1831a:7. See species synonymy.
Cistudo carolina: Gray, 1831b:18. See species synonymy.
Emys kinosternoides Gray, 1831b:32. See species synonymy.
Cistudo virginea Agassiz, 1857:445. See species synonymy.

Terrapene carinata: Strauch, 1862:96. See species synonymy.
Terrapene eurypygia Cope, 1869:124. See species synonymy.
Cistudo carolina var. *cinosternoides*: Boulenger, 1889:117. *Nomen substitution*.
Terrapene carolina carolina: Stejneger and Barbour, 1917:115. First use of combination.
Terrapene carolina: Breder, 1924:63. See species synonymy.

• **Definition.** The carapace is short, broad, and brightly patterned with the marginals nearly vertical or slightly flared, and each hind foot has four toes.

2. *Terrapene carolina mexicana* (Gray)

Cistudo (Onychotria) mexicana Gray, 1849:17. Type-locality, "Mexico", restricted to vicinity of Tampico, Tamaulipas by Müller, 1936:112. Syntypes, British Museum of Natural History 1947.3.5.48, stuffed, mounted male, collector and date unknown; and 1947.3.4.3, stuffed adult female, purchased by "Mr. Warwick", date unknown (examined by authors).
Cistudo mexicana: Gray, 1856:40.
Onychotria mexicana: Dugés, 1888:107.
Cistudo carolina var. *mexicana*: Boulenger, 1889:118.
Onychotria mexicana: Herrera, 1890:330. *Lapsus calami*.
Chelopus mexicanus: Velasco, 1892:79.
Terrapene mexicana: Baur, 1893:677.
Terrapene goldmani Stejneger, 1933:119. Type-locality, "Chijol (or Chijoles), southeastern corner of the State of San Luis Potosi, Mexico; in the coast plain." Holotype, U.S. National Museum 46251, alcoholic female, collected by E.W. Nelson and E.A. Goldman, 11 May 1898 (examined by authors).
Terrapene yucatanica: Ditmars, 1934:4. In part.
Terrapene nelsoni: Ditmars, 1934:40. In part.
Terrapene mexicana mexicana: Smith and Taylor, 1950b:346.
Terrapene carolina mexicana: Milstead, 1967:168. First use of combination.
Terrapene mexicana: Nietzke, 1973:371. *Ex errore*.
Terrapene mexicana mexicana: Nietzke, 1973:371. *Lapsus calami*.



Figure 4. *Terrapene carolina mexicana* (Roger W. Barbour).

• **Definition.** The carapace is elongated and high-domed with the third vertebral elevated into a small hump and only moderate flaring of the posterior marginals; the carapace is pale yellow or tan to light olive with dark seams; each hind foot has three toes.

3. *Terrapene carolina triunguis* (Agassiz)

Cistudo triunguis Agassiz, 1857:445. Type-locality, "New Orleans", Louisiana. Syntypes, Museum of Comparative Zoology 1519 (seven females, one male), 1522 (female); from type-locality, collected by Dr. N.P. Benedict, no date; 1523-1524 (females), 1525 (male) from type-locality, collected by F.C. Copes, no date (not examined by authors); U.S. National Museum 86871-86872 (alcoholic females, formerly Museum of Comparative Zoology 1519) from type-locality, collected by Dr. N.P. Benedict, no date (examined by authors); U.S. National Museum 22 (alcoholic female) from Washington, Adams County, Mississippi, collected by "Wailes", date unknown (examined by authors); U.S. National Museum 213736 (alcoholic female) from Mississippi, collected by "Wailes", date unknown (examined by authors); U.S. National Museum 7546 (dry, stuffed female with separate skull) and 131838 (alcoholic female) localities, collectors, and dates unknown (examined by authors).

Cistudo carolina var. *cinosternoides*: Boulenger, 1889:117. In part. *Cistudo marnocki*: Cope, 1878:229. In part.

Terrapene triunguis: Taylor, 1895.

Terrapene carolina triunguis: Strecker, 1910:121. First use of combination.

Terrapene whitneyi Hay, 1916b:8. Type-locality, post-Wisconsin gravels in Austin, Travis County, Texas (from label: "Basement of Littlefield Building, Austin, Texas, Pleistocene"). Holotype, U.S. National Museum 8617, complete carapace and plastron (examined by authors).

Terrapene bulweri Hay, 1920:133. Type-locality, not given. Holotype, U.S. National Museum 9921, disarticulated posterior portion of carapace, and plastron, collected by D.V. Schuchardt in 1915 (examined by authors).

H. bulweri: Hay, 1920:134. *Ex errore*.

Terrapene impressa Hay, 1924:245. Type-locality, "Munson's Shoals, 2 or 3 miles below Pittbridge", Brazos County, Texas. Holotype, Texas Memorial Museum, University of Texas (TMM-TAMU) 2401, posterior lobe of plastron (apparently misidentified as anterior lobe in original description), collected by Dr. Mark Francis in 1923 (not examined by authors). See Comments.

Terrapene llanensis Oelrich, 1953:35. Type-locality, "Sangaman, late Pleistocene ... tributary of Shorts Creek ... Lone Tree Arroyo ... Meade County, Kansas." Holotype, Museum of Paleontology, University of Michigan 26957, partial carapace and plastron, and other bones, collected by University of Michigan Field Party, 28 July 1950 (examined by authors).

Terrapene canaliculata: Milstead, 1956:163. In part.

• **Definition.** The highest point on the carapace is more posteriorly positioned than in other subspecies of *T. carolina*; in cross-section it is peaked in appearance, and is typically tan or olive with an obscure pattern of radiating dashes and, often, dark seam borders. Orange or yellow spots usually are conspicuous on both head and forelimbs; males may have totally red heads. Three toes are present on each hind foot.

4. *Terrapene carolina major* (Agassiz)

Cistudo major Agassiz, 1857:445. Type-locality, "Mobile [Alabama] ... Florida", restricted to Mobile, Mobile County, Alabama by Schmidt, 1953:94. Syntypes, Museum of Comparative Zoology 1505, 1507, 1509-1510 (females), 1506 (male), 1508 (juvenile, probably male) (not examined by authors). See Comments.

Cistudo carolina var. *major*: Boulenger, 1889:117.

Terrapene major: Taylor, 1895:575.

Terrapene carolina major: Carr, 1940:101. First use of combination.

• **Definition.** The carapace is long, sometimes exceeding 20 cm, with few or no markings, or marks obscured by black or tan pigment in males, but radiating yellow spots or dashes in females; the posterior marginals are strongly flared, and four toes occur on each hind foot.



Figure 5. *Terrapene carolina yucatana* (Roger W. Barbour).

5. *Terrapene carolina bauri* Taylor

Terrapene bauri Taylor, 1895:576. Type-locality, "Florida", restricted to Orlando, Orange County, Florida by Schmidt, 1953:94. Holotype, U.S. National Museum 8352, alcoholic female, collected by F.B. Meek in 1875 (examined by authors).

Terrapene innoxia Hay, 1916a:61. Type-locality, "Pleistocene. Vero, St. Lucie County, Florida." Holotype, U.S. National Museum 8824 (originally Florida Geological Survey 7080), complete carapace, collected by E.H. Sellards, no date (examined by authors).

Terrapene carolina bauri: Carr, 1940:100. First use of combination.

• **Definition.** The dark brown carapace has a bright pattern of yellow radiating lines, is highest posterior to the center, and has little or no flaring of the posterior marginals. The plastron also bears a pattern of radiating light lines on each scute, and two light, longitudinal stripes are present on each side of the head. Each hind foot usually has only three toes.

6. *Terrapene carolina yucatana* (Boulenger)

Cistudo yucatana Boulenger, 1895:330. Type-locality, "North Yucatan", México; restricted to Chichen Itza, Yucatán, México by Smith and Taylor, 1950a:35. Syntypes, British Museum of Natural History 1947.3.5.45-47, dry adult females, collected by "Gaulmer", but originated from O. Salvin (examined by authors).

Cistudo mexicana: Barbour and Cole, 1906:147. *Nec* Gray, 1849.

Terrapene yucatana: Siebenrock, 1909:492.

Terrapene mexicana: Müller, 1936:100. *Nec* Gray, 1849.

Terrapene mexicana yucatana: Smith, 1939:17.

Terrapene carolina yucatana: Milstead, 1967:168. First use of combination.

Terrapene mexicana yucatana: Nietzke, 1973:371. *Lapsus calami*.

• **Definition.** The carapace is long, high-domed, with the third vertebral elevated into a small hump, and little flaring of the posterior marginals. It is tan or straw-colored with dark radiating dashes or black scute borders. Each hind foot has four toes.

Literature Cited

- Abercrombie, J. 1977. Myiasis in the eastern box turtle caused by *Phaenicia coeruleiviridis* (Diptera: Calliphoridae). *J. Washington Acad. Sci.* 67:155-156.
- Adams, N.A., D.L. Clussen, and J. Skillings. 1989. Effects of temperature on voluntary locomotion of the eastern box turtle, *Terrapene carolina carolina*. *Copeia* 1989:905-915.
- Adler, K.K. 1968. Turtles from archeological sites in the Great Lakes region. *Michigan Archaeol.* 14:147-163.
- . 1969. Elimination of box turtles in western New York state by prehistoric man. *J. Herpetol.* 2:179.
- . 1970. The influence of prehistoric man on the distribution of the box turtle. *Ann. Carnegie Mus. Nat. Hist.* 41:263-280.
- and R.A. Small. 1963. Bioelectrogenesis in the urinary bladders

- of turtles, genera *Pseudemys* and *Terrapene*. J. Ohio Herpetol. Soc. 4:63-64.
- Agassiz, L. 1857. Contributions to the natural history of the United States of America, first monograph. Vol. 1, part 2. North American Testudinata. Little, Brown and Co., Boston. p. 233-452d.
- Allard, H.A. 1935. The natural history of the box turtle. Sci. Monthly 41:325-338.
- . 1939. Mating of the box turtle ending in death to the male. Copeia 1939:109.
- . 1948. The eastern box turtle and its behavior. Part 1. J. Tennessee Acad. Sci. 23:307-321.
- . 1949. The eastern box turtle and its behavior. Part 2. J. Tennessee Acad. Sci. 24:146-152.
- Alsop, F.J., III and G.O. Wallace. 1978. Eastern box turtle (*Terrapene carolina*) feeding on TV tower-killed birds. J. Tennessee Acad. Sci. 53:134.
- Altland, P.D. 1951. Observations on the structure of the reproductive organs of the box turtle. J. Morph. 89:599-621.
- , B. Highman, and B. Wood. 1951. Some effects of x-irradiation on turtles. J. Exp. Zool. 118:1-19.
- and M. Parker. 1955. Effects of hypoxia upon the box turtle. Amer. J. Physiol. 180:421-427.
- and E.C. Thompson. 1958. Some factors affecting blood formation in turtles. Proc. Soc. Exp. Biol. Med. 99:456-459.
- Alvarez, S.T. 1976. Restos óseos de las excavaciones de Tlatilco, edo de México. Restos óseos rescatados del cenote Sagrado de Chichen Itza, Yucatán. Apuntes para la Arqueología, México 15: 1-39.
- Anderson, N.G. and K.M. Wilbur. 1948. Gastric carbonic anhydrase and acid secretion in turtles. J. Cell. Comp. Physiol. 31:293-302.
- Anton, T.G. 1990. Predation on the house sparrow, *Passer domesticus*, by the Gulf Coast box turtle, *Terrapene carolina major*, under seminatural conditions. Bull. Chicago Herpetol. Soc. 25: 137-142.
- Arndt, R.G. 1980. An albino eastern box turtle (*Terrapene carolina*). Herpetol. Rev. 11:30.
- Auffenberg, W. 1958. Fossil turtles of the genus *Terrapene* in Florida. Bull. Florida St. Mus. Biol. Sci. 3:51-92.
- . 1959. A Pleistocene *Terrapene* hibernaculum, with remarks on a second complete box turtle skull from Florida. J. Florida Acad. Sci. 22:49-53.
- . 1967. Further notes on fossil box turtles of Florida. Copeia 1967: 319-325.
- and J.B. Iverson. 1979. Demography of terrestrial turtles, p. 541-569. In M. Harless and H. Morlock (eds.), Turtles: perspectives and research. John Wiley & Sons, New York.
- and W.W. Milstead. 1965. Reptiles in the Quaternary of North America, p. 557-568. In H.E. Wright, Jr. and D.G. Frey (eds.), The Quaternary of the United States. A review volume for the VII Congress of the International Association for Quaternary Research. Princeton Univ. Press, Princeton, New Jersey.
- Avery, R.A. 1982. Field studies of body temperature and thermoregulation, p. 93-166. In C. Gans and F.H. Pough (eds.), Biology of the Reptilia, physiology C, physiological ecology, Vol. 12. Academic Press, New York.
- Babcock, H.L. 1919. The turtles of New England. Mem. Boston Soc. Nat. Hist. 8:323-431.
- . 1928. The long life of turtles. Bull. Boston Soc. Nat. Hist. 46:9-10.
- . 1939. Growth of an individual box turtle. Copeia 1939:175.
- Baird, I.L. 1970. The anatomy of the reptilian ear, p. 193-275. In C. Gans and T.S. Parsons (eds.), Biology of the Reptilia, morphology B, Vol. 2. Academic Press, London.
- Balmer, G.W. 1951. The comparative histology of the enteron of some American turtles. Pap. Michigan Acad. Sci., Arts, Letts. 35:91-99.
- Barbour, R.W. 1950. The reptiles of Big Black Mountain, Harlan County, Kentucky. Copeia 1950:100-107.
- Barbour, T. and L.J. Cole. 1906. Vertebrata from Yucatan, reptiles, amphibians and fishes. Bull. Mus. Comp. Zool. 50:146-159.
- and H.C. Stetson. 1931. A revision of the Pleistocene species of *Terrapene* of Florida. Bull. Mus. Comp. Zool. 72:295-299.
- Barten, S.L. 1981. Shell anomaly in a three-toed box turtle, *Terrapene carolina triunguis*: a unilateral pattern. Bull. Chicago Herpetol. Soc. 16:47-49.
- Bartholomew, G.A. 1982. Physiological control of body temperature, p. 167-211. In C. Gans and F.H. Pough (eds.), Biology of the Reptilia, physiology D, physiological ecology, Vol. 13. Academic Press, New York.
- Baur, G. 1891. American box tortoises. Science 17:190-191.
- . 1893. Further notes on American box turtles. Amer. Nat. 27:677-678.
- Baxter, J.S. and R. Meek. 1988. Cryosurgery in the treatment of skin disorders in reptiles. Herpetol. J. 1:227-229.
- Behler, J.L. 1979. The Audubon Society field guide to North American reptiles and amphibians. Alfred A. Knopf, New York.
- Belekova, M.G. 1979. Neurophysiology of the forebrain, p. 287-359. In C. Gans, R.G. Northcutt, and P. Ulsinski (eds.), Biology of the Reptilia, neurology B, Vol. 10. Academic Press, London.
- Bell, T. 1825. A monograph of the tortoises having a moveable sternum, with remarks on their arrangement and affinities. Zool. J. 2:299-310.
- Bellairs, A. d'A. and S.V. Bryant. 1985. Autotomy and regeneration in reptiles, p. 301-410. In C. Gans and F. Billett (eds.), Biology of the Reptilia, development B, Vol. 15. John Wiley & Sons, New York.
- Beltz, R.E. 1954. Notes on the winter behavior of captive non-indigenous Chelonia in Southern California. Herpetologica 10:124.
- . 1958. Eating habits of some captive Testudines. Herpetologica 13:272.
- Bennett, A.F. 1982. The energetics of reptilian activity, p. 155-199. In C. Gans and F.H. Pough (eds.), Biology of the Reptilia, physiology D, physiological ecology, Vol. 13. Academic Press, New York.
- and W.R. Dawson. 1976. Metabolism, p. 127-223. In C. Gans and W.R. Dawson (eds.), Biology of the Reptilia, physiology A, Vol. 5. Academic Press, London.
- Bentley, P.J. 1976. Osmoregulation, p. 365-412. In C. Gans and W.R. Dawson (eds.), Biology of the Reptilia, physiology A, Vol. 5. Academic Press, London.
- Beresford, W.A., M.P. Donovan, J.M. Henninger, and M.P. Waalkes. 1981. Lead in bone and soft tissues of box turtles caught near smelters. Bull. Environ. Contam. Toxicol. 27:349-352.
- Berry, J.F. and R. Shine. 1980. Sexual size dimorphism and sexual selection in turtles (Order Testudines). Oecologia (Berlin) 44:185-191.
- Bickham, J.W. and R.J. Baker. 1979. Canalization model of chromosomal evolution. Bull. Carnegie Mus. Nat. Hist. 13:70-84.
- and J. L. Carr. 1983. Taxonomy and phylogeny of the higher categories of cryptodiran turtles based on a cladistic analysis of chromosomal data. Copeia 1983:918-932.
- Blanck, R.M. 1968. Hybridization of the box turtles *Terrapene carolina* and *T. ornata* in western Louisiana. Proc. Louisiana Acad. Sci. 31:54-57.
- . 1971. An annotated check list and biogeographic analysis of the insular herpetofauna of the Apalachicola region, Florida. Herpetologica 27:407-430.
- Bleakney, S. 1958. The significance of turtle bones of archaeological sites in southern Ontario and Quebec. Can. Field-Nat. 71:1-5.
- Bockman, D.E. 1970. The thymus, p. 111-133. In C. Gans and T.S. Parsons (eds.), Biology of the Reptilia, morphology C, Vol. 3. Academic Press, London.
- Bogert, C.M. and R.B. Cowles. 1947. Moisture loss in relation to habitat selection in some Floridian reptiles. Amer. Mus. Nov. (1358): 1-34.
- Boice, R. 1970. Competitive feeding behavior in captive *Terrapene c. carolina*. Anim. Behav. 18:703-710.
- Bonnaterre, P.J. 1789. Erpétologie. Tableau encyclopédique et méthodique des trois règnes de la nature. Panckoucke, Paris.
- Boulenger, G.A. 1889. Catalogue of the chelonians, rhynchocephalians, and crocodiles in the British Museum (Natural History). Taylor and Francis, London.
- . 1895. On American box-tortoises. Ann. Mag. Nat. Hist. (6) 15: 330-331.
- Bowler, J.K. 1977. Longevity of reptiles and amphibians in North American collections as of November, 1975. Soc. Stud. Amphib. Rept., Misc. Publ., Herp. Circ. (6):1-32.
- Brattstrom, B.H. 1965. Body temperatures of reptiles. Amer. Midl. Nat. 73:376-422.
- Braun, J. and G.R. Brooks, Jr. 1987. Box turtles (*Terrapene carolina*) as potential agents for seed dispersal. Amer. Midl. Nat. 117:312-318.
- Breder, R.B. 1924. Notes on the drinking habits of *Terrapene carolina* (Linnaeus). Copeia (131):63-64.
- . 1927. Turtle trailing: a new technique for studying the life habits of certain Testudinata. Zoologica 9:231-243.
- Brimley, C.S. 1904. The box turtles of southeastern North America. J.

- Elisha Mitchell Sci. Soc. 20:1-8.
- Brisbin, I.L., Jr. 1972. Seasonal variations in live weights and major body components of captive box turtles. *Herpetologica* 28:70-75.
- Brosigole, L. 1976. Heat training in the box turtle (*Terrapene carolina*). *Bull. Psychon. Soc.* 8:339-340.
- Burghardt, G.M. 1977. Learning processes in reptiles, p. 555-681. In C. Gans and D.W. Tinkle (eds.), *Biology of the Reptilia, ecology and behavior A*, Vol. 7. Academic Press, London.
- Bush, F.M. 1959. Foods of some Kentucky herptiles. *Herpetologica* 15:73-77.
- Cahn, A.R. 1937. The turtles of Illinois. *Illinois Biol. Monogr.* 16:1-218.
- Carey, J.H. 1970. The amygdala of the box turtle, *Terrapene c. carolina*. *J. Comp. Neurol.* 138:251-263.
- Carpenter, C.C. 1956. Carapace pits in the three-toed box turtle, *Terrapene carolina triunguis* (Chelonia-Emydidae). *Southwest. Nat.* 1:83-86.
- . 1957. Hibernation, hibernacula and associated behavior of the three-toed box turtle (*Terrapene carolina triunguis*). *Copeia* 1957:278-282.
- and G.W. Ferguson. 1977. Variation and evolution of stereotyped behavior in reptiles, p. 335-554. In C. Gans and D.W. Tinkle (eds.), *Biology of the Reptilia, ecology and behavior A*, Vol. 7. Academic Press, London.
- Carr, A.F. 1940. A contribution to the herpetology of Florida. *Univ. Florida Biol. Ser.* 3:1-118.
- . 1952. *Handbook of turtles: the turtles of the United States, Canada, Baja California*. Cornell Univ. Press, Ithaca, New York.
- Carr, J.L. and T.W. Houseal. 1981. Post-hibernation behavior in *Terrapene carolina triunguis* (Emydidae). *Southwest. Nat.* 26:199-200.
- Clark, H.F., M.M. Cohen, and D.T. Karzon. 1970. Characterization of reptilian cell lines established at incubation temperature of 23-36°. *Proc. Soc. Exp. Biol. Med.* 133:1039-1047.
- Clark, H.F. and D.T. Karzon. 1967a. *Terrapene* heart (Th-1), a continuous cell line from the heart of the box turtle *Terrapene carolina*. *Exp. Cell Res.* 48:263-267.
- and —. 1967b. Acquired tolerance to elevated temperatures in a poikilothermic cell line *Terrapene*, Th-1. *Exp. Cell Res.* 48:269-275.
- Clark, H.W. 1935. On the occurrence of a probable hybrid between the eastern and western box turtles, *Terrapene carolina* and *T. ornata*, near Lake Maxinkuckee, Indiana. *Copeia* 1935:148-150.
- Clark, W.S. 1982. Turtles as a food source of nesting bald eagles in the Chesapeake Bay Region. *J. Field Ornithol.* 53:49-51.
- Claussen, D.L., P.M. Daniel, S. Jiang, and N.A. Adams. 1991. Hibernation in the Eastern Box Turtle, *Terrapene c. carolina*. *J. Herpetol.* 25:334-341.
- Cochran, D.M. and C.J. Goin. 1970. *The new field book of reptiles and amphibians*. G.P. Putnam's Sons, New York.
- Cohen, H. 1986. Life history notes: *Terrapene carolina carolina*. *Herpetol. Rev.* 17:25.
- Conant, R. 1975. *A field guide to reptiles and amphibians of eastern and central North America*. 2nd ed. Houghton Mifflin, Boston.
- and J.T. Collins. 1991. *A field guide to reptiles and amphibians, eastern and central North America*. 3rd ed. Houghton Mifflin, Boston.
- Congdon, J.D., R.E. Gatten, Jr. and S.J. Morreale. 1989. Overwintering activity of box turtles (*Terrapene carolina*) in South Carolina. *J. Herpetol.* 23:179-181.
- and J.W. Gibbons. 1985. Egg components and reproductive characteristics of turtles: relationships to body size. *Herpetologica* 41:194-205.
- Congello, K. 1978. Nesting and egg laying behavior in *Terrapene carolina*. *Proc. Pennsylvania Acad. Sci.* 52:51-56.
- Cook, A.D., D. Abb, and W. Frair. 1972. A new record size box turtle. *Int. Turtle Tort. Soc. J.* 6(3):9-17.
- Cooper, E.L., A.E. Klempau, and A.G. Zapata. 1985. Reptilian immunity, p. 599-678. In C. Gans, F. Billett, and P.F.A. Maderson (eds.), *Biology of the Reptilia, development A*, Vol. 14. John Wiley & Sons, New York.
- Cope, E.D. 1869. Synopsis of extinct Batrachia, Reptilia and Aves of North America. *Trans. Am. Philos. Soc.* (1869) 14:1-124.
- . 1878. Description of new reptiles from the Upper Tertiary formations of the West. *Proc. Am. Philos. Soc.* 17:229.
- Cosgrove, G.E. 1965. The radiosensitivity of snakes and box turtles. *Rad. Res.* 25:706-712.
- Costanzo, J.P. and D.L. Claussen. 1990. Natural freeze tolerance in the terrestrial turtle, *Terrapene carolina*. *J. Exp. Zool.* 254:228-232.
- Creaser, E.P. 1940. A note on the food of the box turtle. *Copeia* 1940:131.
- Crispens, C.G., Jr. and K.R. Marion. 1981. Granulomas in reptiles: a report of four cases. *J. Alabama Acad. Sci.* 52:48-52.
- Crooks, F.P. and P.W. Smith. 1958. An instance of twinning in the box turtle. *Herpetologica* 14:170-171.
- Capula, M. 1989. *Simon & Schuster's guide to reptiles and amphibians of the world*. Simon & Schuster, New York.
- Cuvier, G.J.L.F. 1829. *Le règne animal.. nouvelle édition*. Vol. 2. Dèterville, Paris.
- Daudin, F.M. 1801-1803. *Histoire naturelle, générale et particulière des reptiles; ouvrage faisant suite à l'histoire naturelle générale et particulière, composée par Lecher de Buffon, et rédigée par C. S. Sonnini, membre de plusieurs sociétés savantes*. 8 vols. F. Dufart, Paris.
- Dearoff, K. 1956. Survey of North American cave vertebrates. *Proc. Pennsylvania Acad. Sci.* 30:201-210.
- Deck, R.S. 1927. Longevity of *Terrapene carolina* (Linné). *Copeia* (160):179.
- DeRosa, C.T. and D.H. Taylor. 1980. Homeward orientation mechanisms in three species of turtles (*Trionyx spinifer*, *Chrysemys picta*, *Terrapene carolina*). *Behav. Ecol. Sociobiol.* 7:15-23.
- and —. 1982. A comparison of compass orientation mechanisms in three turtles (*Trionyx spinifer*, *Chrysemys picta* and *Terrapene carolina*). *Copeia* 1982:394-399.
- Dessauer, H.C. 1970. Blood chemistry of reptiles: physiological and evolutionary aspects, p. 1-72. In C. Gans and T.S. Parsons (eds.), *Biology of the Reptilia, morphology C*, Vol. 3. Academic Press, London.
- Dickson, J.D., III. 1953. The private life of the box turtle. *Everglades Nat. Hist.* 1:58-62.
- Dimond, M.T. 1983. Sex of turtle hatchlings as related to incubation temperature. *Proc. Rept. Symp. Capt. Prob. Husband.* (1982) 6:88-101.
- Ditmars, R.L. 1934. A review of the box turtles. *Zoologica* 17:1-44.
- Dodge, C.H., M.T. Dimond, and C.C. Wunder. 1978. Effects of temperature on the incubation time of eggs of the eastern box turtle (*Terrapene carolina carolina* Linné). *Florida Mar. Res. Publ.* (33):8-11.
- and G.E. Folk, Jr. 1963. Notes on the comparative tolerance of some Iowa turtles to oxygen deficiency (hypoxia). *Proc. Iowa Acad. Sci.* 70:438-441.
- Dolbeer, R.A. 1969. Population density and home range size of the eastern box turtle (*Terrapene carolina*) in eastern Tennessee. *A.S.B. Bull.* 16:49.
- . 1971. Winter behavior of the eastern box turtle, *Terrapene carolina* L., in eastern Tennessee. *Copeia* 1971:758-760.
- Dozy, A.M., C.A. Reynolds, J.M. Still, and T.H.J. Huisman. 1964. Studies on animal hemoglobins. I. Hemoglobins in turtles. *J. Exp. Zool.* 155:343-348.
- Duellman, W.E. and A. Schwartz. 1958. Amphibians and reptiles of southern Florida. *Bull. Florida St. Mus. Biol. Sci.* 3:181-324.
- Duges, A.A.P. 1888. *Erpetología del Valle de México. La Naturaleza* (2) 1:97-146.
- Duguy, R. 1970. Numbers of red blood cells and their variation, p. 93-109. In C. Gans and T.S. Parsons (eds.), *Biology of the Reptilia, morphology C*, Vol. 3. Academic Press, London.
- Dundee, H.A. and D.A. Rossman. 1989. *The amphibians and reptiles of Louisiana*. Louisiana St. Univ. Press, Baton Rouge.
- Edney, J.M. and W.R. Allen. 1951. Age of the turtle, *Terrapene carolina carolina* (Linnaeus). *Copeia* 1951:312.
- Ehrenfeld, D.W. 1979. Behavior associated with nesting, p. 417-434. In M. Harless and H. Morlock (eds.), *Turtles: perspectives and research*. John Wiley & Sons, New York.
- Elghammer, R.W. and R.E. Johnson. 1976. Heat production by the eastern box turtle (*Terrapene carolina carolina*) as measured by direct calorimetry. *Trans. Illinois St. Acad. Sci.* 69:200-206.
- , R.O. Swan, R.E. Johnson, and D. Murphy. 1979. Physical characteristics of male and female eastern box turtles (*Terrapene carolina carolina*) found in Illinois. *Trans. Illinois St. Acad. Sci.* 72:1-8.
- Ernst, C.H. 1968. Evaporative water-loss relationships of turtles. *J. Herpetol.* 2:159-161.
- . 1981. Courtship behavior of the male *Terrapene carolina major* (Reptilia, Testudines, Emydidae). *Herpetol. Rev.* 12:7-8.
- and R.W. Barbour. 1972. *Turtles of the United States*. Univ. Press Kentucky, Lexington.

- and —. 1989. Turtles of the world. Smithsonian Inst. Press, Washington, D.C.
- and E.M. Ernst. 1979. Synopsis of protozoans parasitic in native turtles of the United States. Bull. Maryland Herpetol. Soc. 15:1-15.
- Ernst, E.M. and C.H. Ernst. 1977. Synopsis of helminths endoparasitic in native turtles of the United States. Bull. Maryland Herpetol. Soc. 13:1-75.
- Erskine, D.J. and V.H. Hutchison. 1981. Melatonin and behavioral thermoregulation in the turtle, *Terrapene carolina triunguis*. Physiol. Behav. 26:991-994.
- Evans, L.T. 1951a. Male hormone effects upon the claws of juvenile box tortoises. Anat. Rec. 109:370.
- . 1951b. Endocrines and secondary sex characters of the box tortoise, *Terrapene carolina*. Anat. Rec. 111:555.
- . 1952. Endocrine relationships in turtles III. Some effects of male hormone in turtles. Herpetologica 8:11-14.
- . 1953. The courtship pattern of the box turtle, *Terrapene carolina carolina*. Herpetologica 9:189-192.
- . 1964. Hormones and behavior in box tortoises. Texas Rep. Biol. Med. 22:205.
- . 1968. The evolution of courtship in the turtle species, *Terrapene carolina*. Am. Zool. 8:696-696.
- Ewert, M.A. 1979. The embryo and its egg: development and natural history, p. 333-413. In M. Harless and H. Morlock (eds.), Turtles: perspectives and research. John Wiley & Sons, New York.
- . 1985. Embryology of turtles, p. 72-267. In C. Gans, F. Billett, and P.F.A. Maderson (eds.), Biology of the Reptilia, development A, Vol. 14. John Wiley & Sons, New York.
- Ewing, H.E. 1926. The common box turtle, a natural host for chiggers. Proc. Biol. Soc. Washington 39:19-20.
- . 1933. Reproduction in the eastern box turtle *Terrapene carolina carolina* (Linné). Copeia 1933:95-96.
- . 1939. Growth in the eastern box turtle, with special reference to the dermal shields of the carapace. Copeia 1939:87-92.
- . 1943. Continued fertility in female box turtles following mating. Copeia 1943:112-114.
- Fay, L.P. 1984. Mid-Wisconsin and Mid-Holocene herpetofauna of eastern North America: a study in minimal contrast. Spl. Publ. Carnegie Mus. Nat. Hist. (8):14-19.
- Ferguson, D.E. 1963. Notes concerning the effects of heptachlor on certain poikilotherms. Copeia 1963:441-443.
- Finneran, L.C. 1948. Reptiles at Branford, Connecticut. Herpetologica 4:123-126.
- Flanigan, W.F., Jr., C.P. Knight, K.M. Hartse, and A. Rechtschaffen. 1974. Sleep and wakefulness in chelonian reptiles I. The box turtle, *Terrapene carolina*. Arch. Ital. Biol. 112:227-252.
- Forbes, W.C. 1966. A cytological study of the Chelonia. Dissert. Abst. 2:4169B-4170B.
- Fox, H. 1977. The urogenital system of reptiles, p. 1-157. In C. Gans and T.S. Parsons (eds.), Biology of the Reptilia, morphology E, Vol. 6. Academic Press, London.
- Fox, W. 1956. Seminal receptacles in snakes. Anat. Rec. 124:518-540.
- Frair, W. 1962. Current studies of chelonian serology. Bull. Serol. Mus. (27):7-8.
- . 1963. Blood group studies with turtles. Science 140:1412-1414.
- Frothingham, L. 1936. Observations on young box turtles. Bull. Boston Soc. Nat. Hist. 78:3-8.
- Gaffney, E.S. 1979. Comparative cranial morphology of Recent and fossil turtles. Bull. Am. Mus. Nat. Hist. 164:65-376.
- Gatten, R.E., Jr. 1987. Cardiovascular and other physiological correlates of hibernation in aquatic and terrestrial turtles. Amer. Zool. 27:59-68.
- Gibbons, J.W. and R.D. Semlitsch. 1991. Guide to reptiles and amphibians of the Savannah River site. Univ. Georgia Press, Athens.
- Gilllette, D.D. 1974. A proposed revision of the evolutionary history of *Terrapene carolina triunguis*. Copeia:1974:537-539.
- Gilmore, C.W. 1928. On fossil turtles from the Pleistocene of Florida. Proc. U.S. Natl. Mus. 71:1-10.
- Gmelin, J. 1788-1793. Caroli a Linné, Systema naturae per regna tria naturae, secundum classes, ordines, genera, species, cum characteribus differentiis synonymis locis reformata. Ed. 13. Lipsiae 1:1038-1516.
- Gould, E. 1957. Orientation in box turtles, *Terrapene c. carolina* (Linnaeus). Biol. Bull. 112:336-348.
- . 1959. Studies on the orientation of turtles. Copeia 1959:174-176.
- Graham, T.E. and V.H. Hutchison. 1969. Centenarian box turtles. Int. Turtle Tort. Soc. J. 3(3):25-29.
- Gray, J.E. 1831a. A synopsis of the species of the class Reptilia, p. 1-110. In Griffiths and Pidgeon (eds.), The animal kingdom. Whitaker, Treacher, and Co., London. Vol. 9 (appendix).
- . 1831b. Synopsis reptilium. Part 1. Cataphracta. Tortoises, crocodiles and enyaliosaurians. Treuttel, Wurtz and Co., London.
- . 1849. Description of a new species of box turtle from Mexico. Proc. Zool. Soc. London 1849:16-17.
- . 1856. Catalogue of shield reptiles in the collection of the British Museum. Part I. Testudinata (tortoises). Taylor and Francis, London.
- Green, J.D. 1950. The comparative anatomy of the hypophysis with special reference to its blood supply and innervation. Amer. J. Anat. 88:225-311.
- Greene, H.W. 1988. Antipredator mechanisms in reptiles, p. 1-152. In C. Gans and R.B. Huey (eds.), Biology of the Reptilia, ecology B, defense and life history, Vol. 16. Alan R. Liss, Inc., New York.
- Gregory, P.T. 1982. Reptilian hibernation, p. 53-154. In C. Gans and F.H. Pough (eds.), Biology of the Reptilia, physiology D, physiological ecology, Vol. 13. Academic Press, New York.
- Grobman, A.B. 1990. The effect of soil temperatures on emergence from hibernation of *Terrapene carolina* and *T. ornata*. Amer. Midl. Nat. 124:366-371.
- Guibé, J. and H. Saint-Girons. 1955. Espace vital et territoire chez les reptiles. La Nature, Paris (3245):358-362.
- Haines, R.W. 1946. A revision of the movements of the forearm in tetrapods. J. Anat. 80:1-11.
- . 1969. Epiphysis and sesamoids, p. 81-115. In C. Gans, A. d'A. Bellairs and T.S. Parsons (eds.), Biology of the Reptilia, morphology A, Vol. 1. Academic Press, London.
- Harding, J.H. 1978. A case of interspecific aggression in captive turtles. Herp 14(2):3-6.
- Harless, M. 1979. Social behavior, p. 475-492. In M. Harless and H. Morlock (eds.), Turtles: perspectives and research. John Wiley & Sons, New York.
- and H. Morlock (eds.). 1979. Turtles: perspectives and research. John Wiley & Sons, New York.
- Hatt, R.T. and D.A. Langebartel. 1953. Faunal and archaeological researches in Yucatan caves. The reptiles and amphibians. Bull. Cranbrook Inst. Sci. (33):1-42.
- Hattan, L.R. and D.H. Gist. 1975. Seminal receptacles in the eastern box turtle, *Terrapene carolina*. Copeia 1975:505-510.
- Hay, O.P. 1906. Descriptions of two new genera (*Echmatemys* and *Xenochelys*) and two new species (*Xenochelys formosa* and *Terrapene putnami*) of fossil turtles. Bull. Am. Mus. Nat. Hist. 22:27-31.
- . 1907. Descriptions of seven new species of turtles from the Tertiary of the United States. Bull. Amer. Mus. Nat. Hist. 23:847-863.
- . 1916a. Descriptions of some Floridian fossil vertebrates, belonging mostly to the Pleistocene. Ann. Rep. Florida Geol. Surv. 8:39-76.
- . 1916b. Descriptions of some fossil vertebrates found in Texas. Bull. Univ. Texas 71:3-24.
- . 1920. Descriptions of some Pleistocene vertebrates found in the United States. Proc. U.S. Natl. Mus. 58:83-146.
- . 1924. The Pleistocene of the Middle Region of North America and its vertebrate animals. Carnegie Inst. Washington Publ. 322A:1-385.
- Hayes, F.E. 1989. Defensive stances in turtles. Herpetol. Rev. 20:4-5.
- Hayes, W.N. and E.I. Saiff. 1967. Visual alarm reactions in turtles. Anim. Behav. 15:102-106.
- Hebard, W.B. and H.A. Charipper. 1955. A comparative study of the morphology and histochemistry of the reptilian adrenal gland. Zoologica 40:101-123.
- Helms, D.R. and H.J. Stains. 1966. Kills of mammals and birds and entrapment of turtles on railroad tracks. Trans. Illinois St. Acad. Sci. 59:297.
- Helmy, F.M. and M.H. Hack. 1967. Some comparative studies of the vertebrate kidney. Comp. Biochem. Physiol. 20:55-63.
- , R.G. Yeager, and M.H. Hack. 1969. Some histochemical observations on the blood cells of six species of turtles. Comp. Biochem. Physiol. 29:1281-1283.
- Hensley, M. 1959. Albinism in North American amphibians and reptiles. Publ. Mus. Michigan St. Univ., Biol. Ser. 1:133-159.
- Herrera, A.L. 1890. Notes acerca de los vertebrados del Valle de México. La Naturaleza (2) 1:299-342.
- Hildemann, W.H. 1962. Immunogenetic studies of amphibians and reptiles. Ann. New York Acad. Sci. 97:139-152.

- Hoffstetter, R. and J.-P. Gasc. 1969. Vertebrae and ribs of modern reptiles, p. 201-310. In C. Gans, A. d'A. Bellairs, and T.S. Parsons (eds.), *Biology of the Reptilia, morphology A*, Vol. 1. Academic Press, London.
- Holcomb, C.M. and W.S. Parker. 1979. Mirex residues in eggs and livers of two long-lived reptiles (*Chrysemys scripta* and *Terrapene carolina*) in Mississippi. *Bull. Environ. Contam. Toxicol.* 23:369-371.
- Holman, J.A. 1967. A Pleistocene herpetofauna from Ladd's, Georgia. *Bull. Georgia Acad. Sci.* 25:154-166.
- . 1969a. Herpetofauna of the Pleistocene Slaton local fauna of Texas. *Southwest. Nat.* 14:2-3-212.
- . 1969b. The Pleistocene amphibians and reptiles of Texas. *Publ. Mus. Michigan St. Univ., Biol. Ser.* 4:161-192.
- . 1975. Herpetofauna of the Wakeeney local fauna (lower Pliocene: Clarendonian) of Trego County, Kansas. *Mus. Paleontol. Univ. Michigan Paps. Paleontol.* 12:49-66.
- . 1977. The Pleistocene (Kansan) herpetofauna of Cumberland Cave, Maryland. *Ann. Carnegie Mus. Nat. Hist.* 46:157-172.
- . 1978. The late Pleistocene herpetofauna of the Devil's Den Sinkhole, Levy County, Florida. *Herpetologica* 34:228-237.
- . 1981. Fossil amphibians and reptiles of Nebraska and Kansas. *Natl. Geogr. Soc. Res. Rep.* 13:253-262.
- . 1984. Life history note (Morphology and Behavior): *Terrapene carolina carolina* (Eastern Box Turtle). *Herpetol. Rev.* 15:114.
- and C.J. Clausen. 1984. Fossil vertebrates associated with paleo-Indian artifact at Little Salt Spring, Florida. *J. Vert. Paleontol.* 4:146-154.
- and A.J. Winkler. 1987. A mid-Pleistocene (Irvingtonian) herpetofauna from a cave in southcentral Texas. *Texas Mem. Mus., Univ. Texas Pearce-Sellards Ser.* (44):1-17.
- Huang, C.C. and H.F. Clark. 1967. Chromosome changes in cell lines of the box turtle (*Terrapene carolina*) at two different temperatures. *Can. J. Genet. Cytol.* 9:449-461.
- Hutchison, V.H. 1956. An annotated list of the amphibians and reptiles of Giles County, Virginia. *Virginia J. Sci.* n.s. 7:80-86.
- . 1979. Thermoregulation, p. 207-228. In M. Harless and H. Morlock (eds.), *Turtles: perspectives and research*. John Wiley & Sons, New York.
- and H. Szarski. 1965. Number of erythrocytes in some amphibians and reptiles. *Copeia* 1965:373-375.
- and A. Vinegar. 1963. The feeding of the box turtle, *Terrapene carolina*, on a live snake. *Herpetologica* 4:284.
- , —, and R.J. Kosh. 1966. Critical thermal maxima in turtles. *Herpetologica* 22:32-41.
- Hutton, K.E. 1964. Effects of hypothermia on turtle blood glucose. *Herpetologica* 20:129-131.
- and C.J. Goodknight. 1957. Variation in the blood chemistry of turtles under active and hibernating conditions. *Physiol. Zool.* 30:198-207.
- Iverson, J.B. 1977. Reproduction in freshwater and terrestrial turtles of north Florida. *Herpetologica* 33:205-212.
- . 1982. Biomass in turtle populations: a neglected subject. *Oecologia (Berlin)* 55:69-76.
- . 1986. A checklist with distribution maps of the turtles of the world. Priv. printed, Paust Print., Richmond, Indiana.
- and C.R. Etchberger. 1989. The distribution of the turtles of Florida. *Florida Sci.* 52:119-144.
- Jackson, C.G., Jr., M. Fulton, and M.M. Jackson. 1972. Cranial asymmetry with massive infection in a box turtle. *J. Wildl. Dis.* 8:275-277.
- , M.M. Jackson, and J.D. Davis. 1969. Cutaneous myiasis in the three-toed box turtle, *Terrapene carolina triunguis*. *Bull. Wildl. Dis. Assoc.* 5:114.
- and J.M. Kaye. 1974. Occurrence of box turtles, *Terrapene* (Testudines: Testudinidae) in the Pleistocene of Mississippi. *Herpetologica* 30:11-13.
- James, D. 1961. The measurements of an aged box turtle. *Proc. Arkansas Acad. Sci.* 15:26-28.
- Johnston, J. 1915. The cell masses in the forebrain of the turtle, *Cistudo carolina*. *J. Comp. Neurol.* 25:393-468.
- Karasov, W.H., D.H. Solberg, and J.M. Diamond. 1985. What transport adaptations enable mammals to absorb sugars and amino acids faster than reptiles? *Amer. J. Physiol.* 249:G271-G283.
- Kasinsky, H.E., H. Mann, S.Y. Huang, L. Fabre, B. Coyle, and E.M. Byrd. 1987. On the diversity and amino of sperm basic proteins in vertebrates: V. Cytochemical and amino acid analysis in Squamata, Testudines, and Crocodylia. *J. Exp. Zool.* 243:137-151.
- Kepner, W.A. 1912. The larva of *Sarcophaga*, a parasite of *Cistudo carolina* and the morphogenesis of its respiratory apparatus. *Biol. Bull.* 22:163-172.
- Kiester, A.R. 1985. Sex-specific dynamics of aggregation and dispersal in reptiles and amphibians. *Contr. Mar. Sci.* 27(suppl.):425-434.
- , C.W. Schwartz, and E.R. Schwartz. 1982. Promotion of gene flow by transient individuals in an otherwise sedentary population of box turtles (*Terrapene carolina triunguis*). *Evolution* 36:617-619.
- Killebrew, F.C. 1977. Mitotic chromosomes of turtles. IV. The Emydidae. *Texas J. Sci.* 29:245-253.
- King, W. and J.V. Griffo, Jr. 1958. A box turtle fatality apparently caused by *Sarcophaga cistudinis* larvae. *Florida Entomol.* 41:44.
- Klimstra, W.D. and F. Newsome. 1960. Some observations on the food coactions of the common box turtle, *Terrapene c. carolina*. *Ecology* 41:639-647.
- Kirsche, W. 1969. Zur Haltung der Dosenschildkröte *Terrapene carolina* (L.). *Aquar. Terrar.* 16:344-346.
- Knoll, C.M. 1935. Shield variation, reduction, and age in a box terrapin, *Terrapene carolina*. *Copeia* 1935:101.
- Lacépède, B.G.E. 1788. Histoire naturelle des quadrupèdes ovipares et des serpents. Vol. 1 (Ovipares). Hôtel de Thou, Paris.
- Lapeer, F. 1953. Nogmaals de ouderdom van reptilian en amphibien. *Lacerta* 11:55-56.
- Latham, R. 1968. Fungus-eating habits of the eastern box turtle on Long Island. *Engelhardtia* 1(1):12.
- . 1969a. Eastern box turtle eats green oak gall. *Engelhardtia* 2(1):1.
- . 1969b. Turtle remains found in prehistoric Indian sites on eastern Long Island. *Engelhardtia* 2(1):6.
- and F.C. Schlauch. 1969. Inscribed eastern box turtles. *Int. Turtle Tort. Soc. J.* 3(4):13.
- Lawler, A. 1977. Notes on sarcophagids from the new host *Romalea microptera*, and from *Terrapene carolina carolina*. *Gulf Res. Rep.* 6:69-70.
- Legler, J.M. 1955. Observations on sexual behavior of captive turtles. *Lloydia* 18:95-99.
- Lemkau, P.J. 1970. Movements of the box turtle, *Terrapene c. carolina* (Linnaeus), in unfamiliar territory. *Copeia* 1970:781-783.
- Leone, C.A. and F.E. Wilson. 1961. Studies of turtle sera I. The nature of the fastest-moving electrophoretic component in the sera of nine species. *Physiol. Zool.* 34:297-305.
- Leuck, B.E. and C.C. Carpenter. 1981. Shell variation in a population of three-toed box turtles (*Terrapene carolina triunguis*). *J. Herpetol.* 15:53-58.
- Levell, J.P. 1985. Some observations on the mating behavior of *Terrapene carolina triunguis* in captivity. *Bull. Chicago Herpetol. Soc.* 20:40-41.
- Lillywhite, H.B. and P.F.A. Maderson. 1982. Skin structure and permeability, p. 397-442. In C. Gans and F.H. Pough (eds.), *Biology of the Reptilia, physiology C, physiological ecology*, Vol. 12. Academic Press, New York.
- Lin, N. 1958. Coital movement pattern in pairings of a male *Terrapene carolina bauri* with a female *Terrapene c. triunguis*. *British J. Herpetol.* 2:96-97.
- Linnaeus, C. 1758. *Systema naturae per regna tria naturae, secundum classes, ordines, genera, species, cum characteribus, differentiis, synonymis, locis*. 10th ed. Vol. 1. L. Salvius, Stockholm.
- Lynn, W.G. 1937. Variation in scutes and plates in the box turtle, *Terrapene carolina*. *Amer. Nat.* 71:421-426.
- Magiola, L. 1984. The effects of estrogen on skeletal calcium metabolism and on plasma parameters of vitellogenesis in the male, three-toed box turtle (*Terrapene carolina triunguis*). *Gen. Comp. Endocr.* 54:162-170.
- Manton, M.L. 1979. Olfaction and behavior, p. 289-301. In M. Harless and H. Morlock (eds.), *Turtles: perspectives and research*. John Wiley & Sons, New York.
- Mao, S.-H., W. Frair, F.-Y. Yin, and Y.-W. Guo. 1987. Relationships of some cryptodiran turtles as suggested by immunological cross-reactivity of serum albumins. *Biochem. System. Ecol.* 15:621-624.
- Martin, P.S. 1958. A biogeography of reptiles and amphibians in the Gomez Farias Region, Tamaulipas, Mexico. *Misc. Publ. Mus. Zool. Univ. Michigan* (101):1-102.
- Mathis, A. and F.R. Moore. 1988. Geomagnetism and homeward orientation of the box turtle, *Terrapene carolina*. *Ethology* 78:265-

- 274.
- McAllister, C.T. 1987. *Phaenicia* (Diptera: Calliphoridae) myiasis in a three-toed box turtle, *Terrapene carolina triunguis* (Reptilia: Emydidae), from Arkansas. Texas J. Sci. 39:377-378.
- McClure, W.L. and W.W. Milstead. 1967. *Terrapene carolina triunguis* from the late Pleistocene of southeast Texas. Herpetologica 23:321-322.
- McCoy, C.J. 1969. Diet of bullfrogs (*Rana catesbeiana*) in central Oklahoma farm ponds. Proc. Oklahoma Acad. Sci. 48:44-45.
- and N.D. Richmond. 1966. The identity of the Chinese box turtle, *Terrapene c. carolina*. Copeia 1966:886.
- McDonald, H.S. 1976. Methods for the physiological study of reptiles, p. 19-126. In C. Gans and W.R. Dawson (eds.), Biology of the Reptilia, physiology A, Vol. 5. Academic Press, London.
- McDowell, S.B. 1964. Partition of the genus *Clemmys* and related problems in the taxonomy of the aquatic Testudinidae. Proc. Zool. Soc. London 143:239-279.
- Mehrtens, J.M. 1951. Saurophagous box turtle. Herpetologica 7:101.
- Merrem, B. 1820. Tentamen systematis amphibiorum (Versuch eines Systems der Amphibien). Johann Christian Krieger, Marburg.
- Mertens, R. 1950. Über Reptilien-bastarde. Senckenbergiana Biol. 31:127-144.
- 1956. Über Reptilien-bastarde, II. Senckenbergiana Biol. 37:383-394.
- 1973. Das Alter bei der Geschlechtsreife der Dosenschildkröte *Terrapene c. carolina*. Salamandra 9:34-35.
- Milstead, W.W. 1956. Fossil turtles of Friesenhahn Cave, Texas, with the description of a new species of *Testudo*. Copeia 1956:162-171.
- 1967. Fossil box turtles (*Terrapene*) from central North America, and box turtles of eastern Mexico. Copeia 1967:168-179.
- 1969. Studies on the evolution of box turtles (genus *Terrapene*). Bull. Florida St. Mus. Biol. Sci. 14:1-113.
- Minnich, J.E. 1982. The use of water, p. 325-395. In C. Gans and F.H. Pough (eds.), Biology of the Reptilia, physiology C, physiological ecology, Vol. 12. Academic Press, New York.
- Moll, E.O. 1979. Reproductive cycles and adaptations, p. 305-331. In M. Harless and H. Morlock (eds.), Turtles: perspectives and research. John Wiley & Sons, New York.
- Monagas, W.R. and R.E. Gatten, Jr. 1983. Behavioral fever in turtles *Terrapene carolina* and *Chrysemys picta*. J. Therm. Biol. 8:285-288.
- Moodie, K.B. and T.R. Van Devender. 1977. Additional late Pleistocene turtles from Jones Spring, Hickory County, Missouri. Herpetologica 33:87-90.
- Moore, J.C. 1953. Shrew on box turtle menu. Everglades Nat. Hist. 1:129.
- Morgan, L.R. and R. Singh. 1969. Cytochrome oxidase-succinic dehydrogenase activities and the melanin pigment cycle in poikilothermic vertebrates. Comp. Biochem. Physiol. 28:83-94.
- Morgareidge, K.R. and H.T. Hammel. 1975. Evaporative water loss in box turtles: effects of rostral brainstem and other temperatures. Science 187:366-368.
- Morlock, H. 1979. Learning, p. 455-474. In M. Harless and H. Morlock (eds.), Turtles: perspectives and research. John Wiley & Sons, New York.
- Muir, J.H. 1984. Life history notes: *Terrapene carolina carolina*. Herpetol. Rev. 15:20.
- Müller, G. 1987. Schildkröten. Land-, Sumpf- und Wasserschildkröten im Terrarium. Eugen Ulmer GmbH & Co., Stuttgart.
- Müller, L. 1936. Beiträge zur Kenntnis der Schildkrötenfauna von Mexico. Zool. Anz. 113:97-114.
- Murphy, J. 1976. The natural history of the box turtle. Bull. Chicago Herpetol. Soc. 11:2-45.
- Murphy, T.D. 1964. Box turtle, *Terrapene carolina*, in stomach of copperhead, *Agkistrodon contortrix*. Copeia 1964:221.
- Musacchia, X.J. and M.I. Chladek. 1961. Investigations of the cloacal bladders in turtles. Amer. Zool. 1:376.
- Myers, C. 1952. *Terrapene carolina triunguis* winters in the egg. Herpetologica 8:80.
- 1956. An unusual feeding habit in the box turtle. Herpetologica 12:155.
- Neill, W.T. 1948a. Odor of young box turtle. Copeia 1948:130.
- 1948b. Hibernation of amphibians and reptiles in Richmond County, Georgia. Herpetologica 4:107-114.
- 1954. Ranges and taxonomic allocations of amphibians and reptiles in the southeastern United States. Publ. Res. Div. Ross Allen Rept. Inst. 1:75-96.
- 1958. The occurrence of amphibians and reptiles in saltwater areas, and a bibliography. Bull. Mar. Sci. Gulf Caribbean 8:1-97.
- Nelson, O.E. 1953. Comparative embryology of the vertebrates. Constable & Co., London.
- Nichols, J.T. 1939a. Data on size, growth and age in the box turtle, *Terrapene carolina*. Copeia 1939:14-20.
- 1939b. Disposition in the box turtle. Copeia 1939:107.
- 1939c. Range and homing of individual box turtles. Copeia 1939:125-127.
- 1940. Eye color in the box turtle (*Terrapene carolina*). Copeia 1940:130.
- Nietzke, G. 1969. Die Terrarien Tiere 1. Eugen Ulmer, Stuttgart.
- 1973. *Terrapene carolina carolina* - Dosenschildkröte. Aquar. Terr. 7:371-372.
- Nigrelli, R.F. 1954. Some longevity records of vertebrates. Trans. New York Acad. Sci. (2) 16:296-299.
- Obst, F.J. 1986. Turtles, tortoises and terrapins. St. Martin's Press, New York.
- Oelrich, T.M. 1953. A new box turtle from the Pleistocene of southwestern Kansas. Copeia 1953:33-38.
- Oliver, J.A. 1953a. The oldest inhabitant of the zoo. Anim. Kingdom 56:76-78.
- 1953b. Young Billy Johnson's old box turtle. Anim. Kingdom 56:154-156.
- 1955. The natural history of North American amphibians and reptiles. D. Van Nostrand Co., Inc., New York.
- Oliver, J.H., Jr., M.R. Owsley, and C.M. Claiborne. 1988. Chromosomes, reproductive biology, and developmental stages of *Aponomma varanensis* (Acari: Ixodidae). J. Med. Entomol. 25:73-77.
- Olson, R.E. 1989. Notes on evaporative water loss in terrestrial chelonians. Bull. Maryland Herpetol. Soc. 25:49-57.
- Packard, G.C. and M.J. Packard. 1988. The physiological ecology of reptilian eggs and embryos, p. 523-605. In C. Gans and R.B. Huey (eds.), Biology of the Reptilia, ecology B, defense and life history, Vol. 16. Alan R. Liss, Inc., New York.
- Parker, M. and P.D. Altland. 1957. Effects of simulated altitude exposure on turtles. Anat. Rec. 128:600.
- Parsons, T.S. 1960. The structure of the choanae of the Emydinae (Testudines, Testudinidae). Bull. Mus. Comp. Zool. 123:113-127.
- 1968. Variation in the choanal structure of Recent turtles. Can. J. Zool. 46:1235-1263.
- and J.E. Cameron. 1977. Internal relief of the digestive tract, p. 159-223. In C. Gans and T.S. Parsons (eds.), Biology of the Reptilia, morphology E, Vol. 6. Academic Press, London.
- Patterson, R. 1978. Shell growth in the desert tortoise and in box turtles. Proc. Symp. Desert Tort. Council 3:60-68.
- Paukstis, G.L. and F.J. Janzen. 1988. An additional specimen of *Terrapene carolina triunguis* (Reptilia: Testudines) from southern Illinois. Trans. Illinois St. Acad. Sci. 81:283-285.
- Payne, H.J. 1957. Blood oxygen capacity in turtles. Virginia J. Sci. n.s. 8:300.
- and J.D. Burke. 1964. Blood oxygen capacity in turtles. Amer. Midl. Nat. 71:460-465.
- Pence, D.B. and S.D. Casto. 1975. Two new species of the genus *Caminacarus* (Acarina: Cloacaridae) from turtles in Louisiana. J. Parasitol. 61:133-139.
- Penn, G.H., Jr. and K.E. Pottharst. 1940. The reproduction and dormancy of *Terrapene major* in New Orleans. Herpetologica 2:25-29.
- Peters, J.A. 1948. The box turtle as a host for dipterous parasites. Amer. Midl. Nat. 40:472-474.
- Polley, K.P. 1989. A *Terrapene carolina triunguis* from Maryland. Bull. Maryland Herpetol. Soc. 25:58-59.
- Pope, C.H. 1939. Turtles of the United States & Canada. Alfred A. Knopf, New York.
- Posey, M.H. 1979. A study of the homing instinct in *Terrapene carolina carolina* in Maryland. Bull. Maryland Herpetol. Soc. 15:139-140.
- Price, J.W. 1951. A half-century-old box turtle, *Terrapene carolina carolina* (Linnaeus), from northern Ohio. Copeia 1951:312.
- Pritchard, P.C.H. 1979. Encyclopedia of turtles. T.F.H. Publ., Inc., Neptune, New Jersey.
- Proctor, J.B. 1922. Zoological Record XVI. Reptilia and Batrachia. (1920) 57:20.
- Quay, W.B. and D.C. Wilhoft. 1964. Comparative and regional differences in serotonin content of reptilian brains. J. Neurochem. 11:

- 805-811.
- Rafinesque, C.S. 1822. On the turtles of the United States. Kentucky Gazette, Lexington 36 (n.s.1):3.
- Raynaud, A. 1985. Development of limbs and embryonic limb reduction, p. 59-148. In C. Gans and F. Billett (eds.), Biology of the Reptilia, development B, Vol. 15. John Wiley & Sons, New York.
- Reagan, D.P. 1974. Habitat selection in the three-toed box turtle, *Terrapene carolina triunguis*. Copeia 1974:512-527.
- Reimer, D.N. 1981. Multiple nesting by a female box turtle (*Terrapene c. carolina*). Chelonologica 2:53-55.
- Richmond, N.D. 1964. The mechanical function of the testudinate plastron. Amer. Midl. Nat. 72:50-56.
- Risher, J.F. and D.L. Claussen. 1987. The effects of cold acclimation on electrocardiogram parameters in five species of turtles. Comp. Biochem. Physiol., 87A:73-80.
- Robinson, R.R. and B. Schmidt-Nielsen. 1963. Distribution of arginase within the kidneys of several vertebrate species. J. Cell. Comp. Physiol. 62:147-159.
- Rose, F.L. 1986. Carapace regeneration in *Terrapene* (Chelonia: Testudinidae). Southwest. Nat. 31:131-134.
- Rosenbaum, C.P. 1968. Can box turtles be trained? Int. Turtle Tort. Soc. J. 2(5):38.
- Rowley, J.R. and V.L. Moskaluk. 1985. Vitamin A deficiency in a turtle. Mod. Vet. Pract. 66:42-43.
- Ruckes, H. 1929. Studies in chelonian osteology. Part 1. Truss and arch analogies in chelonian pelvises. Ann. New York Acad. Sci. 31:31-80.
- . 1937. The lateral arcades of certain emydids and testudinids. Herpetologica 1:97-119.
- Russo, P.M. 1973. Behavioral thermoregulation and energy budget of the eastern box turtle *Terrapene carolina carolina* (Linne). Int. Diss. Abstr. 33B:3606.
- Rust, R.W. and R.R. Roth. 1981. Seed production and seedling establishment in the mayapple, *Podophyllum peltatum* L. Amer. Midl. Nat. 105:51-60.
- Saint-Girons, H.-C. 1970. Morphology of the circulating blood cells, p. 73-91. In C. Gans and T.S. Parsons (eds.), Biology of the Reptilia, morphology C, Vol. 3. Academic Press, London.
- Savage, J.M. 1966. The origins and history of the Central American herpetofauna. Copeia 1966:719-766.
- Say, T. 1825. On the fresh water and land tortoises of the United States. J. Acad. Nat. Sci. Philadelphia 4:203-219.
- Schmidt, K.P. 1953. A check list of North American amphibians and reptiles. 6th ed. Amer. Soc. Ichthyol. Herpetol., Chicago, Illinois.
- Schmidt-Nielsen, K. and P.J. Bentley. 1966. Desert tortoise *Gopherus agassizii*: cutaneous water loss. Science 154:911.
- Schumacher, G.-H. 1973. The head muscles and hyolaryngeal skeleton of turtles and crocodilians, p. 101-199. In C. Gans and T.S. Parsons (eds.), Biology of the Reptilia, morphology D, Vol. 4. Academic Press, London.
- Schwartz, C. and H.M. Kaplan. 1962. The electrical activity of the turtle heart. Amer. Zool. 2:556-557.
- Schwartz, C.W. and E.R. Schwartz. 1974. The three-toed box turtle in central Missouri: its population, home range, and movements. Missouri Dept. Conserv., Terr. Ser. (5):1-28.
- Schwartz, E.R., C.W. Schwartz, and A.R. Kiester. 1984. The three-toed box turtle in Central Missouri, Part II: a nineteen-year study of home range, movements and population. Missouri Dept. Conserv., Terr. Ser. (12):1-28.
- Schwartz, S.R. 1968. December emergence of hatchling *Terrapene carolina* in Philadelphia, Pa. Bull. Philadelphia Herpetol. Soc. 16:20.
- Schweigger, A.F. 1814. Prodrömi monographiae cheloniorum. Regimont, Königsberg, p. 296-327.
- Sehe, C.T. 1965. Comparative studies on the ultimobranchial body in reptiles and birds. Gen. Comp. Endocr. 5:45-59.
- Shalet, L.C. 1977. Social behavior in eastern box turtles. Bull. Philadelphia Herpetol. Soc. 25:9-13.
- Shannon, F.A. and H.M. Smith. 1949. Herpetological results of the University of Illinois Field Expedition, Spring 1949. I. Introduction, Testudines, Serpentes. Trans. Kansas Acad. Sci. 52:494-509.
- Siebenrock, F. 1909. Synopsis der rezenten Schildkröten mit Berücksichtigung der in historischer Zeit ausgestorbenen Arten. Zool. Jahrb., suppl. 10:427-618.
- Skoczylas, R. 1978. Physiology of the digestive tract, p. 589-717. In C. Gans and K.A. Gans (eds.), Biology of the Reptilia, physiology B, Vol. 8. Academic Press, London.
- Smith, H.M. 1939. Notes on Mexican reptiles and amphibians. Field Mus. Nat. Hist. Publ. Zool. 24:15-35.
- . 1958. Total regeneration of the carapace in a box turtle. Turtox News 36:234-238.
- and E.D. Brodie, Jr. 1982. A guide to field identification, reptiles of North America. Golden Press, New York.
- and L.F. James. 1958. The taxonomic significance of cloacal bur-sae in turtles. Trans. Kansas Acad. Sci. 61:86-96.
- and D.C. Nickon. 1961. Preliminary experiments on the role of the cloacal bursae in hibernating turtles. Nat. Hist. Misc. (178):1-8.
- and O. Sanders. 1952. *Terrapene carolina major* in Arkansas. Herpetologica 8:93.
- and R.B. Smith. 1980. Synopsis of the herpetofauna of Mexico. Vol. 6. Guide to Mexican turtles. Bibliographic Addendum III. John Johnson, North Bennington, Vermont.
- and E.H. Taylor. 1950a. An annotated checklist and key to the reptiles of Mexico exclusive of the snakes. Bull. U.S. Natl. Mus. (199):1-253.
- and —. 1950b. Type localities of Mexican reptiles and amphibians. Univ. Kansas Sci. Bull. 33:313-380.
- Smith, P.W. 1955. Presumed hybridization of two species of box turtles. Nat. Hist. Misc. (146):1-3.
- and J.C. List. 1955. Notes on Mississippi amphibians and reptiles. Amer. Midl. Nat. 53:115-125.
- Sonnini, C.S. and P.A. Latreille. 1801. Histoire naturelle des reptiles avec figures dessinées d'après nature. I. Dèterville, Paris.
- Sowerby, J. de C. and E. Lear. 1872. Tortoises, terrapins, and turtles drawn from life. Henry Sotherton, Joseph Baer & Co., London.
- Starck, D. 1979. Cranio-cerebral relations in Recent reptiles, p. 1-38. In C. Gans, R.G. Northcutt, and P. Ulinski (eds.), Biology of the Reptilia, neurology A, Vol. 9. Academic Press, London.
- Stegener, L. 1933. Description of a new box turtle from Mexico. Proc. Biol. Soc. Washington 46:119-120.
- and T. Barbour. 1917. A check list of North American amphibians and reptiles. Harvard Univ. Press, Cambridge, Massachusetts.
- Stickel, L.F. 1950. Populations and home range relationships of the box turtle, *Terrapene c. carolina* (Linnaeus). Ecol. Monogr. 20: 351-378.
- . 1951. Wood mouse and box turtle populations in an area treated annually with DDT for five years. J. Wildl. Mgt. 15:161-164.
- . 1978. Changes in a box turtle population during three decades. Copeia 1978:221-225.
- . 1989. Home range behavior among box turtles (*Terrapene c. carolina*) of a bottomland forest in Maryland. J. Herpetol. 23:40-44.
- and C.M. Bunck. 1989. Growth and morphometrics of the box turtle, *Terrapene c. carolina*. J. Herpetol. 23:216-223.
- Stock, A.D. 1972. Karyological relationships in turtles (Reptilia: Chelonia). Can. J. Genet. Cytol. 14:859-868.
- and G.A. Mengden. 1975. Chromosome banding pattern conservation in birds and nonhomology of chromosome banding patterns between birds, turtles, snakes and amphibians. Chromosoma 50:69-77.
- Strang, C.A. 1983. Spatial and temporal activity patterns in two terrestrial turtles. J. Herpetol. 17:43-47.
- Strass, P.K., K.J. Miles, B.S. McDonald, Jr., and I.L. Brisbin, Jr. 1982. An assessment of factors associated with the daytime use of resting forms by eastern box turtles (*Terrapene carolina carolina*). J. Herpetol. 16:320-322.
- Strauch, A. 1862. Chenologische Studien, mit besonder Beziehung auf die Schildkrötensammlung der Kaiserlichen Akademie der Wissenschaften zu St. Petersburg. Mem. Acad. Imp. Sci. St. Petersburg (7)5(7):1-196.
- Strecker, J.K., Jr. 1910. Description of a new solitary spadefoot (*Scaphiopus haurerii*) from Texas, with other herpetological notes. Proc. Biol. Soc. Washington 23:115-122.
- Stuart, M.D. and G.C. Miller. 1987. The eastern box turtle *Terrapene carolina* (Testudines: Emydidae) in North Carolina. Brimleyana (13):123-131.
- Sturbaum, B.A. 1981. Responses of the three-toed box turtle, *Terrapene carolina triunguis*, to heat stress. Comp. Biochem. Physiol. 70A:199-204.
- . 1982. Temperature regulation in turtles. Comp. Biochem. Physiol. 72A:615-620.
- and J.L. Bergman. 1981. Changes in selected blood components

- of the three-toed box turtle, *Terrapene carolina triunguis*, during heat stress. *Comp. Biochem. Physiol.* 70A:599-602.
- Sullivan, B. and A. Riggs. 1967. Structure, function and evolution of turtle hemoglobins. I. Distribution of heavy hemoglobins. II. Electrophoretic studies. *Comp. Biochem. Physiol.* 23:437-458.
- Surface, H.A. 1908. First report on the economic features of the turtles of Pennsylvania. *Zool. Bull. Div. Zool. Pennsylvania Dept. Agric.* 6:105-196.
- Taylor, W.E. 1895. The box tortoises of North America. *Proc. U.S. Natl. Mus.* 17:573-588.
- Townsend, C.H. 1926. An old tortoise. *Bull. New York Zool. Soc.* 29: 217-218.
- Tucker, J.K. and R.S. Funk. 1976. Twinning in the Gulf Coast box turtle *Terrapene carolina major*. *Florida Sci.* 39:238-239.
- and —. 1977. Eggs and hatchlings of the Gulf Coast box turtle, *Terrapene carolina major*. *Bull. Chicago Herpetol. Soc.* 12:53-57.
- , —, and G.L. Paukstis. 1978a. The adaptive significance of egg morphology in two turtles (*Chrysemys picta* and *Terrapene carolina*). *Bull. Maryland Herpetol. Soc.* 14:10-22.
- , —, and —. 1978b. Reproductive potential of the Gulf Coast box turtle *Terrapene carolina major*. *Bull. Maryland Herpetol. Soc.* 14:23-28.
- Tyler, J.D. 1979. A case of swimming in *Terrapene carolina* (Testudines: Emydidae). *Southwest Nat.* 24:189-190.
- Tyning, T.F. 1990. A guide to amphibians and reptiles. Little, Brown and Co., Boston.
- Ultsch, G.R. and J.F. Anderson. 1988. Gas exchange during hypoxia and hypercarbia of terrestrial turtles: a comparison of a fossorial species (*Gopherus polyphemus*) with a sympatric nonfossorial species (*Terrapene carolina*). *Physiol. Zool.* 61:142-152.
- Vance, J.M. 1985. The tortoise and the pair. *Audubon* 87(4):64-69.
- Velasco, A.L. 1892. Geografía y estadística del estado de Tamaulipas. Geografía y estadística de la República Mexicana. México, D.F., Secr. Fom. 12:78-80.
- Verway, J. 1958. Orientation in migrating marine animals and a comparison with that of other migrants. *Arch. Neerl. Zool.* 13(suppl. 1):418-445.
- Vivien-Raels, B., P. Penet, and B. Claustat. 1988. Pineal and circulating melatonin rhythms in the box turtle, *Terrapene carolina triunguis*: effect of photoperiod, light pulse, and environmental temperature. *Gen. Comp. Endocrinol.* 69:163-173.
- Walker, W.F., Jr. 1973. The locomotor apparatus of Testudines, p. 1-100. In C. Gans and T.S. Parsons (eds.), *Biology of the Reptilia, morphology D*, Vol. 4. Academic Press, London.
- . 1979. Locomotion, p. 435-454. In M. Harless and H. Morlock (eds.), *Turtles: perspectives and research*. John Wiley & Sons, New York.
- Ward, J.P. 1968. Presumed hybridization of two species of box turtle. *Copeia* 1968:874-875.
- . 1980. Comparative cranial morphology of the freshwater turtle subfamily Emydinae: an analysis of the feeding mechanisms and systematics. Ph.D. Dissertation. North Carolina St. Univ., Raleigh.
- Warner, J.L. 1982. Life history note (reproduction): *Terrapene c. carolina*. *Herpetol. Rev.* 13:48-49.
- Weitzmann, I., S.A. Rosenthal, and J.L. Shupack. 1985. A comparison between *Dactylaria gallopava* and *Scolecobasidium humicola*: first report of an infection in a tortoise caused by *S. humicola*. *Sabouraudia* 23:287-293.
- Wermuth, H. and R. Mertens. 1961. Schildkröten, Krocodile, Brückeneschen. Gustav Fischer Verlag, Jena.
- Wetmore, A. 1920. Observations on the hibernation of the box turtle. *Copeia* (77):3-5.
- Wever, E.G. 1978. The reptile ear: its structure and function. Princeton Univ. Press, Princeton, New Jersey.
- and J.A. Vernon. 1956. Auditory responses in the common turtle. *Proc. Natl. Acad. Sci.* 42:962-965.
- Wickham, M.M. 1922. Further notes on the migration of *Terrapene carolina* in Oklahoma. *Proc. Oklahoma Acad. Sci.* 2:22.
- Wilbern, S.E. 1982. Climbing ability of box turtles. *Bull. Maryland Herpetol. Soc.* 18:170-171.
- and D.A. Ingold. 1983. Sexual dimorphism in *Terrapene* shells. *Bull. Chicago Herpetol. Soc.* 18:34-36.
- Williams, E.C., Jr. 1962. A study of the box turtle, *Terrapene carolina carolina* (L.), population in Allee Memorial Woods. *Proc. Indiana Acad. Sci.* 71:399-406.
- and W.S. Parker. 1987. A long-term study of a box turtle (*Terrapene carolina*) population at Allee Memorial Woods, Indiana, with emphasis on survivorship. *Herpetologica* 43:328-335.
- Williams, E.E. 1950. Variation and selection in the cervical central articulations of living turtles. *Bull. Am. Mus. Nat. Hist.* 94:505-562.
- Williams, K.L. and P. Han. 1964. A comparison of the density of *Terrapene coahuila* and *T. carolina*. *J. Ohio Herpetol. Soc.* 4:105.
- Wing, E. 1965. Animal bones associated with two Indian sites on Marcos Island, Florida. *Florida Anthropol.* 18:21-28.
- Winokur, R.M. 1988. The buccopharyngeal mucosa of the turtles (Testudines). *J. Morph.* 196:33-52.
- and J.M. Legler. 1974. Rostral pores in turtles. *J. Morph.* 143:107-120.
- Wood, J.T. and O.K. Goodwin. 1954. Observations on the summer behavior and mortality of box turtles in eastern Virginia. *Virginia J. Sci. n.s.* 5:60-64.
- Wood, S.C. and C.J.M. Lenfant. 1976. Respiration: mechanics, control and gas exchange, p. 225-274. In C. Gans and W.R. Dawson (eds.), *Biology of the Reptilia, physiology A*, Vol. 5. Academic Press, London.
- Yahner, R.H. 1974. Weight change, survival rate and home range change in the box turtle, *Terrapene carolina*. *Copeia* 1974:546-548.
- Yin, F.-Y., W. Frair, and S.H. Mao. 1989. Physical and chemical properties of some turtle blood albumins with taxonomic implications. *Comp. Biochem. Physiol.* 93B:283-289.
- Zangerl, R. 1969. The turtle shell, p. 311-339. In C. Gans, A. d'A. Belairs, and T.S. Parsons (eds.), *Biology of the Reptilia, morphology A*, Vol. 1. Academic Press, London.
- and R.G. Johnson. 1957. The nature of shield abnormalities in the turtle shell. *Fieldiana:Geol.* 10:341-362.
- Zappalorti, R.T. 1976. The amateur zoologist's guide to turtles and crocodilians. Stackpole Books, Harrisburg, Pennsylvania.
- Zug, G.R. 1966. The penial morphology and the relationships of cryptodiran turtles. *Occ. Pap. Mus. Zool. Univ. Michigan* (647):1-24.
- . 1971. Buoyancy, locomotion, morphology of the pelvic girdle and hindlimb, and systematics of cryptodiran turtles. *Misc. Publ. Mus. Zool. Univ. Michigan* (142):1-98.

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